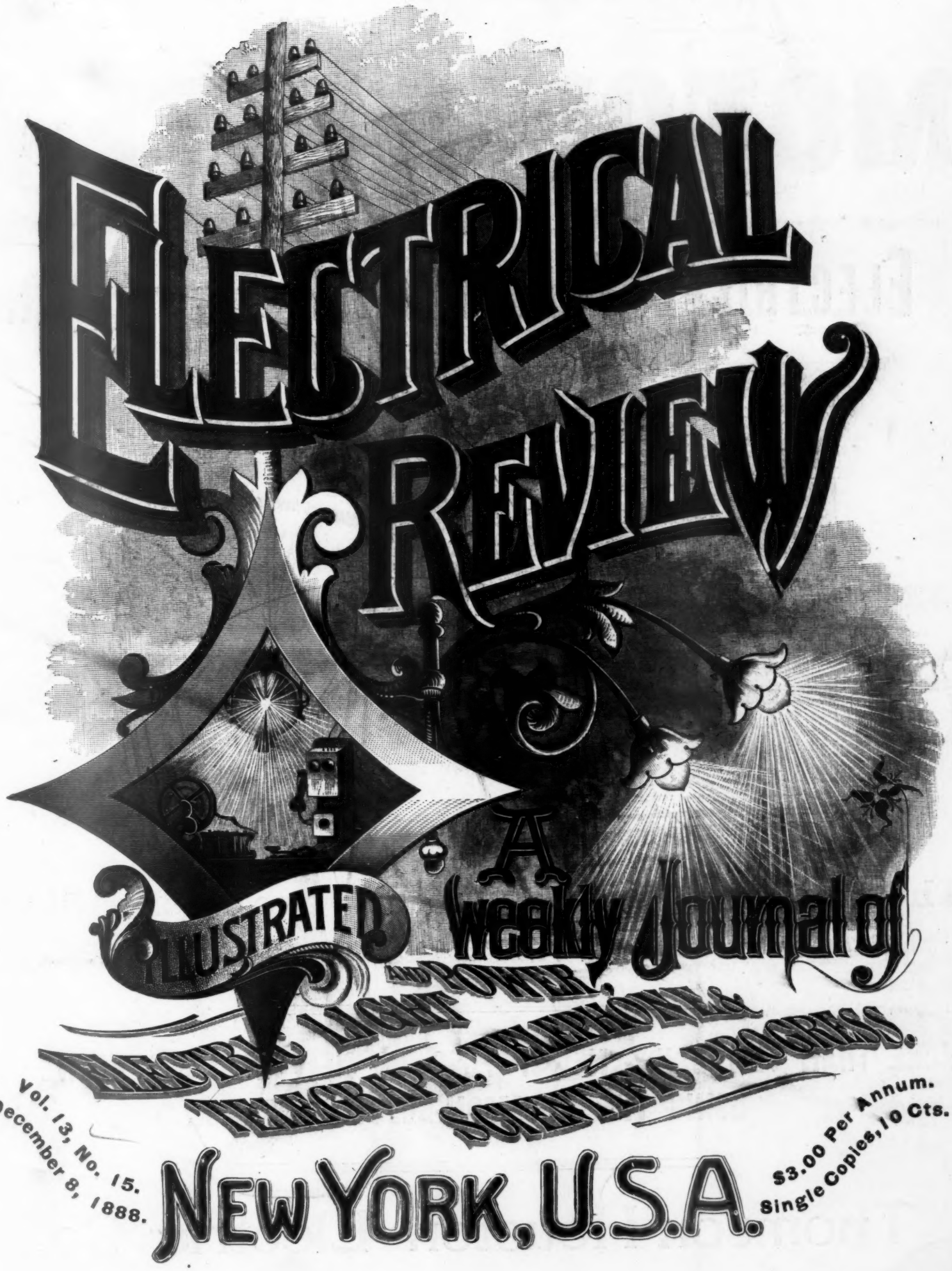
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MOTOR SYSTEM

OF

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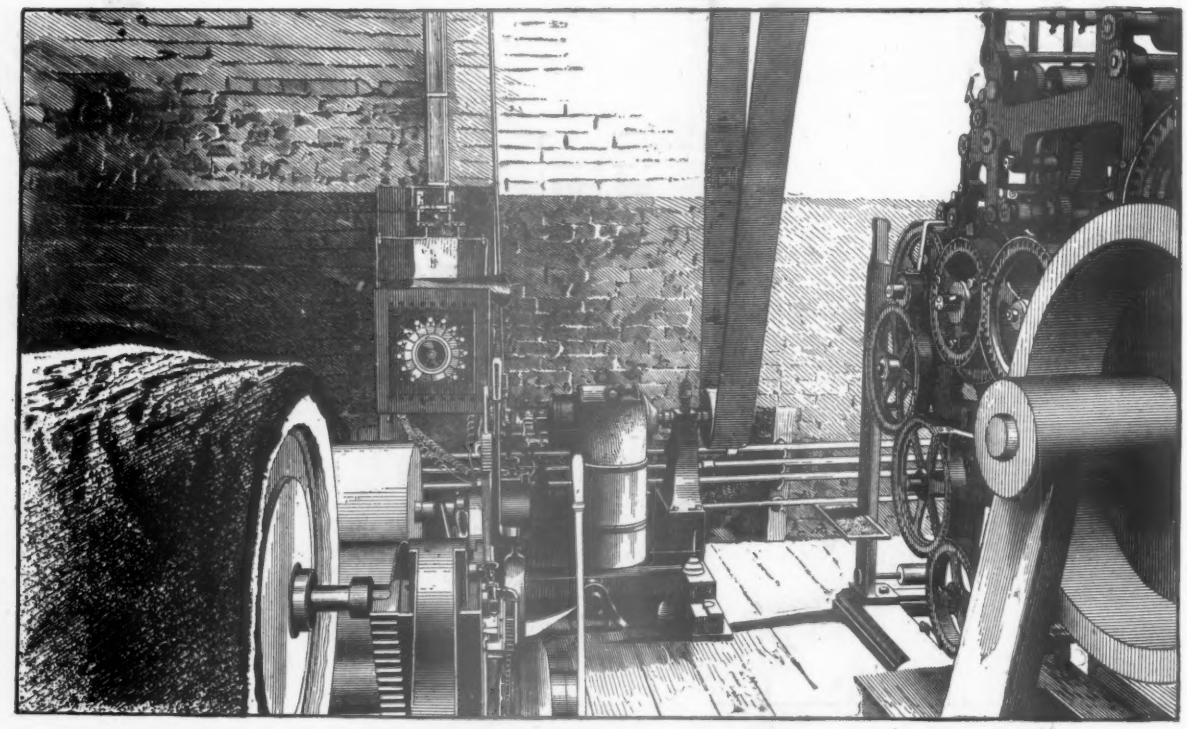

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ELECTRICAL REVIEW

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A WEEKLY JOURNAL OF

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The Mather Electric Company's New 600-Light Dynamo.

The special features of the Mather dynamo, as constructed for arc and incandescent lighting, and for electro-plating, are, a field magnet made in one piece, without joints crossing the lines of magnetic force, and the mode of supporting the armature which combines great rigidity with perfect alignment. It is easy to make a field in one piece of cast iron, and machines constructed with cast iron fields so made, possess all the advantages of machines having wrought iron fields made up of pieces. A wrought iron field in one piece would, however, possess many advantages over cast iron, and if a machine could be so constructed at a reasonable cost, it would be a manifest improvement. It is evident that the cost of wrought iron forgings would make it impossible to forge the core and pole pieces of a large machine in one piece, even adopting the simplest possible form. Some plan must be adopted by which the labor could be reduced to a minimum, and at the same time retain the special features which have made the Mather machine the success it is.

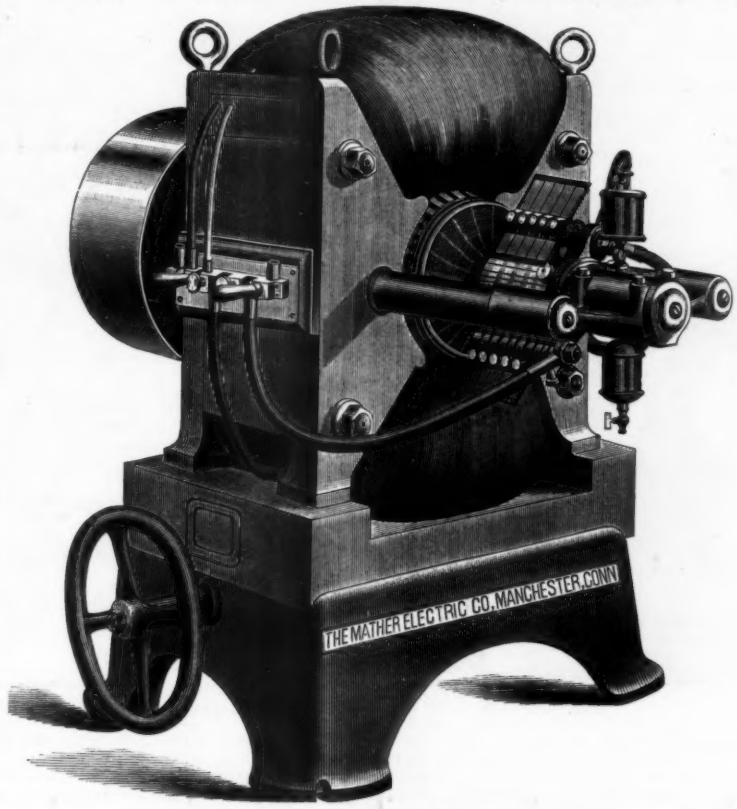
More than a year ago, a machine was designed, in which the core of the field magnet was made of sheets of soft boiler iron, upon which the pole pieces were cast, a perfect weld being obtained by allowing the molten iron to flow through the mould until the iron plates were heated to the welding point. With the same armature and same winding as employed with the cast iron fields, the speed was reduced from 1,800 to less than 1,200 revolutions. The cost of forming the boiler plate was, however, too great to warrant the manufacture of machines upon this plan, and a new design was made in which the form of the wrought iron core was so simplified that it could be forged in one piece. In a machine constructed upon this design, the pole pieces were successfully cast upon cores weighing more than 1,000 pounds.

The form finally adopted is the one shown in the cut. The magnet cores and pole pieces are all wrought iron, and there is no interruption of the magnetic circuit except the air space between the pole pieces and the armature core. The armature of the 350 ampere machine is 12 inches in diameter and 17 inches long, and has 40 coils, each consisting of eight No. 10 wires making one turn around the core. At 750 revolutions, this machine gives a potential of 120 volts. We are informed by the builders that these machines are lighter, run at a slower speed, and, as careful tests have shown, have a higher efficiency than any other machines of the same weight. Four machines of this type are in operation at the American Waltham Watch Factory, four at the Cheney Silk Mills, two will soon be in operation at the Amberg Theatre in New York, and others are in use in other places.

Gloucester's Street Lamps—Policemen Mistake Each Other for Burglars.

Gloucester City, N. J., residents are dissatisfied with the way the streets of the city are lighted. Gas and oil lamps furnish the light, and by the present contract the lamps are lighted at sundown and are extinguished at midnight 20 nights in the month. The other nights the people depend on the moon's rays and are often left in total darkness.

A story is told of two policemen wandering out on one of the streets on such a night and, mistaking each other for burglars, spent the night endeavoring to capture each other until daylight dawned and they recognized each other's uniforms. They carry dark lanterns now, and the rays of the bull's eye are thrown upon the faces of midnight walkers. It costs about $3,100 per year for this manner of furnishing light, but the system has been so long in vogue that many have become to like it and do not desire a change. A dangerous rival, however, has appeared recently. For several nights 13 electric lights have been added to the public illumination, not only in the evening, but until daylight. The change has been a very beneficial one, and many of the citizens want it generally adopted. The friends of the gas company argue that electric light would cost $9,000 per year. The friends of the electric light say the cost would not exceed $4,000, as one light could take the place of three gas lights. It was suggested that the most economical method would be to attach a dynamo to the Water Works engine and allow the city to have control. The entire cost of the plant, it is said, would not exceed $10,000.



A NEW 600-LIGHT DYNAMO.

Starting an Electric Light Plant.

The Cambridge Electric Light Company's new lighting station on Albro street, Cambridgeport, was formally opened recently by an inspection of the premises by nearly 150 prominent citizens, including many members of the city government. An excellent dinner was served in the large room on the second floor. President Josiah Q. Bennett of the company presided, and Hon. L. M. Hannum officiated as toastmaster. Speeches were made by Hon. Robert O. Fuller, Gen. E. W. Hincks, President Henry M. Whitney of the West End Street Railway Company, Hon. Chester W. Kingsley, Hon. Henry O. Houghton, Mr. Charles Bullock, Mr. Edgar R. Champlin, General Manager F. H. Raymond of the company, ex-Alderman F. H. Holton, Alderman Frank H. Teele, Mr. W. A. Bolland of the Thomson Houston Electric Company, and Mr. Warren F. Spalding, of Cambridge.

Previous to the dinner the guests made tour of the premises under the guidance of Supt. W. R. Eaton. The building is two stories high, built of brick, and is 147 feet long and 50 feet wide. On the first floor are seven 45-arc dynamos, two incandescent dynamos, and the boiler room. The system used is the Thomson & Houston. There is a "Buckeye" double engine of 250 horse power, and two Armington and Sims engines of 60 and 90 horse power. On the second floor are the offices of the treasurer and superintendent, ante and toilet rooms, storage and workrooms, and sleeping accommodations for eight linemen. A chimney 150 feet high surmounts the building. The foundations are most substantial, being 10 and 12 feet deep, and resting on a bottom of solid clay. Every precaution was taken with this feature of construction. The furnishings of the offices are costly and beautiful.

In fact, everything has been done to make it one of the finest electric lighting stations in the country, and to answer all the requirements of the city for years to come. In the rear, bordering on the Charles river, is a large wharf for the landing of coal and materials. The company moved into its present new quarters just two years from the time of its opening the old station on Main street.

A Query for the Doctors.

TO THE EDITOR OF ELECTRICAL REVIEW:

In your edition of November 24, I was surprised by what, to me, seemed a rather remarkable statement made in the report of the committee appointed by the Medico-Legal Society to discuss the method of execution by electricity. In the first place it states that the average resistance of the human body is 2,500 ohms.

This seems in a measure vague, as no mention is made of how or where the electrodes were attached in making this measurement.

The skin resistance being much the greatest, the distance through the body separating the electrodes may not make much difference, but neither is the area of the electrodes mentioned, and this latter must certainly make considerable difference.

The report goes on to say that as the most of this resistance is in the skin, therefore the *larger* the surface of the electrode applied to the body the *greater* will be the resistance.

Now, how do these learned M. D.'s reconcile this statement with the law that the resistance of a conductor is inversely proportional to the square of the cross section?

The tissues of the body either form an exception to the law governing other solid and liquid conductors, or else the law does not hold good.

In the latter case I congratulate the committee on their discovery.

I shall be glad to be enlightened in this matter, for in the present day when established laws are being questioned and fond beliefs swept away, one hardly knows what is going next. F. V. HENSHAW.

New York, Nov. 24, 1888.

A Communication from Mr. A. R. Foote on "Danger to Electric Lighting Interests."

TO THE EDITOR OF ELECTRICAL REVIEW:

The incoming of a new industry means the displacement of large and varied investments in the existing order of things. This, one would think, would furnish sufficient resistance to tax youthful energy to its utmost. But it does not. Every new industry not only has to contend with the opposition of conflicting invested interests, but with the ill-advised though well-meant efforts of its avowed friends. It is not possible for anyone who has become enthused with the possibilities of the electric industry to resist the desire to see the use of electricity at once adopted for all services where it is applicable. If such a one is not accustomed to taking broad views of the meaning of things, and is not endowed with strong ability of judgment, his enthusiasm must necessarily run away with him and lead him into errors, especially if the direction his work takes is "to put money into his pocket."

Society is the whole of humanity. An industry comprehends all who are in any way interested in it. A mistake made by any one employed in any capacity in the electric industry, is a source of weakness to every other one in it. Not all mistakes are mistakes in judgment, but if there had been no mistakes in judgment, the mistakes attributable to dishonesty would be easily mastered. Can any one describe the position

the electric industry would be in to-day if every one engaged in it had possessed the courage of patient energy and the ability of judgment, which would have enabled him to act only on the basis of demonstrated facts, instead of but partially verified experiments? How much wasted energy and capital such conservative progress would have saved. If, again, manufacturers and those positioned to make money by making sales, had been governed in all their actions by such conservatism, how many investors with no basis on which to form a judgment, would have been saved from being misguided by those who have used any means to make a sale, assuming that it was no business of theirs if the plant did not prove profitable.

Every manufacturer asserts with the vigor of all the acquired prestige he can command, that the apparatus of his manufacture is the best produced for its purpose. That assertion satisfies his estimate of what is required of him as a manufacturer. It *is* sufficient for the superintendent of the shop. That, however, is but one-half the story. Apparatus is not produced as a scientific specimen of mechanical skill. It has but one practical meaning. It is intended to be *a money maker* for those who, in the final adjustment of things, own and operate it. If it fails to meet this requirement *it is a failure*, though it be the most perfect piece of mechanism ever manufactured. This is true. It is as much the duty of those entrusted with the selling of the apparatus, to see that all the conditions surrounding its sale and use are well calculated to make its use profitable to its owner, as it is the duty of the superintendent of the shop to see that every detail of material, design and workmanship, is calculated to produce a perfect and durable piece of mechanicism.

Can any one tell how changed the position of the electric industry would be if no unprofitable investment had ever been made in it in any way? Can any one doubt which of the two statements would most vitally influence investors: "My apparatus is mechanically perfect," or, "Every person who has invested in my apparatus is making money by its use?"

In the light of the foregoing, what shall be said of a business policy which tends to render all investments unprofitable, in the large department of central station lighting?

It is not strange that such a policy should find an advocate, because the advocate himself, owing to his superficial view of the meaning of things, does not know what he doing.

It is strange that the advocate of such a policy can secure his power from the interest he is hurting; can get assistance to give currency to his views by securing advertisements from those he is injuring, to defray the expenses of issuing his circular, miscalled a "book," and can acquire his ability to misdirect those who consult him, through the standing given him by his unchallenged association with and reception by those who guide the formation of opinion in the electric industry.

That these things can be, shows how little real thought is given to the ultimate issues of the business in which so many are largely interested.

Here is a case in point, the full details of which are on page 589 of *Modern Light and Heat*, in its issue of Nov. 22.

"A careful estimate of the cost of the plant and its working expenses, shows the following: Approximate cost of a 130-light plant, $17,000. Cost of operating, per annum, $4,200, or $32.30 per lamp."

A statement like this throws the burden of any under-estimate, either in the cost of the plant or the expense of operating it, upon every manufacturer of central station apparatus and every local company who own and operate a plant.

If the estimate of the cost of the plant is an underestimate, it will render more difficult the obtaining of a fair price for central station plants.

If the estimate of the operating expenses is too low, it will render more difficult the effort of every central station company to realize a profitable income from its investment.

If a person is sufficiently superficial to enter upon the business policy adopted by the author of these estimates, or if he is willing to do so simply "to put money into his purse," regardless of the injury inflicted on the electric industry, it is fair to assume that his estimates are not safe guides for those for whom they are made. It is much safer to assume that the plant cannot be installed for the price named, if only such apparatus and material which is best for its purpose is used, which alone can furnish the basis of a commercially safe and profitable investment; also, that the plant when installed, cannot be properly maintained and operated for the sum named. If either assumption is true, then the way is being prepared for another bad investment, which is as detrimental to the electric industry as a failure in performance by electrical apparatus, or a death or a fire caused by the current.

It will be well for manufacturers of apparatus, when they prepare their bids to furnish this plant, to at the same time prepare a statement which will satisfy those companies who have already bought their apparatus, that they have been dealt with fairly in the price they have paid for it. More than this, they should furnish local companies with a satisfying argument, which will enable them to obtain a price for the service they are rendering public and private consumers, their clientel being posted on cost, so-called, which will render their investments commercially profitable.

Since writing the above, I have taken the following item from the *N. Y. Times* of November 25th:

"THE COST OF LIGHTING LOCKPORT.

"LOCKPORT, N. Y., Nov. 24.—The sensation of the day has been a circular issued to the taxpayers of this city by Mayor Oliver, showing the way the city is being annually fleeced by the electric light company that is lighting the city. Figures submitted by the Mayor from over a dozen different townsmen, show that the city can be lighted as well as it is now for $4,800 a year where now it pays over $16,000 a year. He suggests that the city should own its own plant, and calls for the opinion of the taxpayers. Opposed to this move are all the wealthy citizens of the place who own stock in the electric plant here. There promises to be a long and bitter fight in the matter."

A. R. FOOTE.

—— Philip Brown, of Blue Ridge Springs, Va., will put an electric light plant in his hotel. He wants to purchase engine and boiler with capacity for 150 incandescent lights.

A Notable Installation.

The Equitable Life Insurance Company sometime ago had its New York building illuminated throughout with 8,000 electric lights, which is the largest isolated plant at present in existence, the one just completed at Boston ranking among the largest in New England. So satisfactory were the results obtained by the use of the United States system, which is the one installed in the New York Equitable building, that the proprietors extended the work in the Boston Equitable building contracting with the New England Weston Electric Light Company which controls the United States system for New England. This notable installation has just been completed and started up.

The capacity of this installation is over 1,000 16-candle power incandescent lamps. The work has been done under the direct supervision of the chief engineer of the building, Mr. J. H. Kazar, and Col. Hewins of the New England Western Electric Light Company.

The dynamo room is situated in the basement of the building, convenient to the boiler house adjoining the room wherein are located the elevator engines, and hoisting drums, steam pipes, injectors, etc. There are two dynamos of the United States standard pattern, of 400 lights capacity each as represented in cut, belted direct by Ireson's matic circuit breaker, and is consequently completely under the control of the attendant. The section of the building under control of each particular switch is indicated by an engraved plate. A ground detector is also attached to the switchboard. The dynamos, either both together in parallel or one alone, may be connected with any number or to all the lights in the building.

Running from the switchboard are 12 wires—six circuits—which enter a shaft near the centre of the building, up which the wires are taken to the point where they enter the elevator well, up which they are continued to the top of the building.

On each floor branch, main wires are run to a box in which is located the individual safety-metals for that floor, and from which smaller wires are run directly to the lamps.

Three of the corridors are illuminated by Mogul lamps of 125 candle-power capacity each, the remaining corridors having 16 candle-power lamps on combination fixtures.

In the main vestibule is hung a very elegant 30-light electrolier, and two 4-light brackets in brass at the head of the marble stairway. There are also two lamps in each elevator. The handsome reading room of the Safe Deposit Company, which is one of the architectural sights of Boston, is lighted by ten 125 candle-power Mogul lamps, fixed in the ceiling, and thirty 16 candle-power

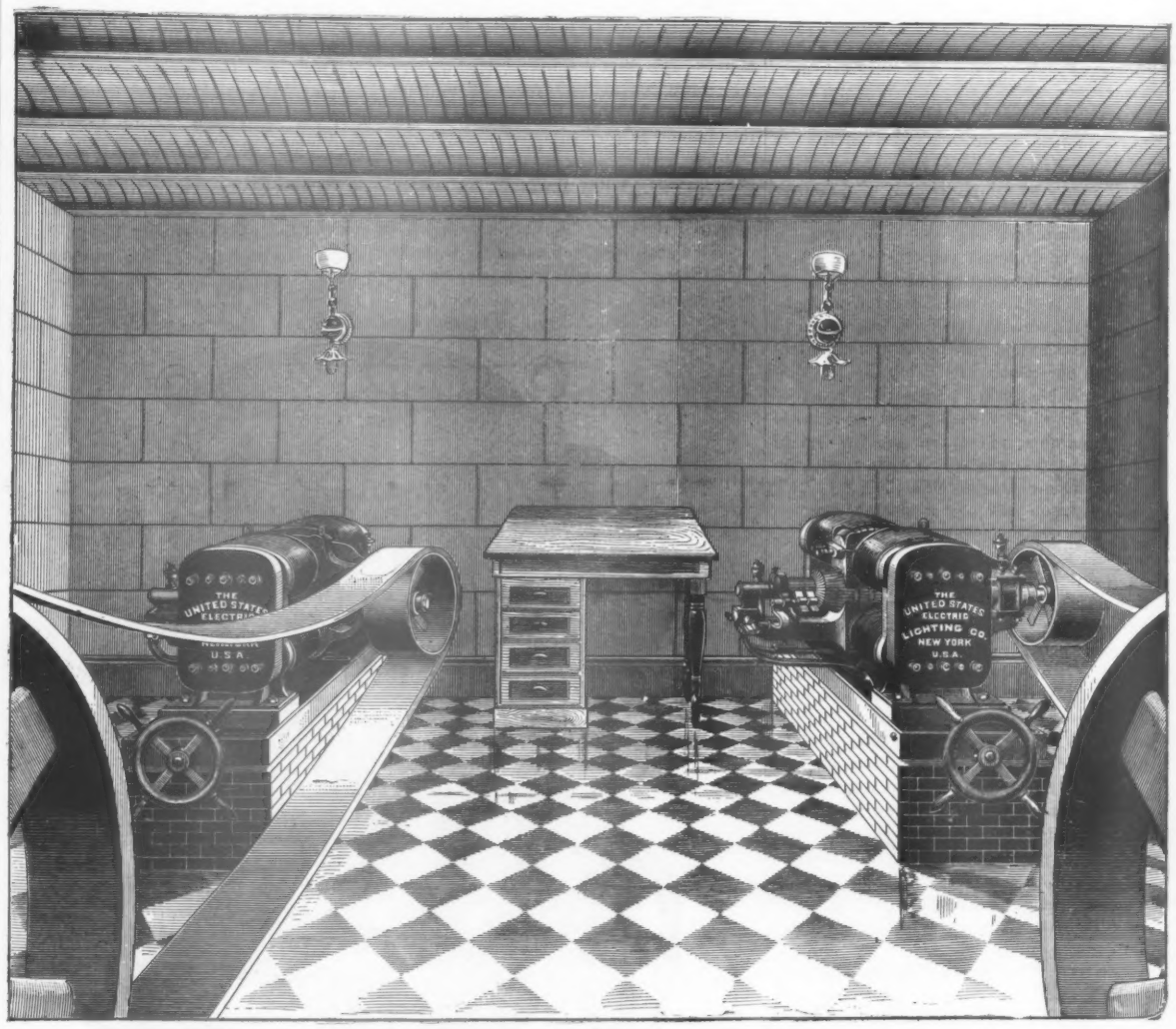


FIG. 1.—VIEW OF DYNAMO ROOM OF EQUITABLE BUILDING ELECTRIC LIGHT PLANT, BOSTON, MASS.

lamps on handsome brackets over writing desks in alcoves, and placed on massive brass Egyptian standards on the reading tables.

The general effects produced are in the highest degree satisfactory.

In various parts of the building about 30 ventilating fans driven by C. & C. motors have been placed, which add much to the comfort of all who have business in it.

Altogether this plant is a great success, and is winning praise for the system and the contractors who have installed it. As we have stated above the New England Weston Electric Light Co. are the contractors for the whole, but the especial features have been looked after or supplied by the following:

The Okonite Co., New York, supplied all the wire and cables, of which the following amounts have been consumed: 1,500 feet No. 2 wire; 1,200 feet No. 3; 20,000 feet 14 twin; 400 feet No. 0 cable. The Jarvis Engineering Company, Boston, supplied and erected the engines; C. L. Ireson, 97 High street, Boston, furnished the link belts; the steam piping was furnished and placed by J. B. Perry & Co., Boston; the non-conducting pipe covering by the Asbestos Packing Co., Boston; C. Moody & Co., Boston, undertook the carpenter work, while the handsome electroliers and brackets were supplied by the Archer Pancoast Manufacturing Co., New York and Boston.

Extracting Gold and Silver by Means of Electricity.

To the Editor of Electrical Review:

Some days ago I was invited to examine the new process of Professor J. C. Wiswell for the extraction of gold and silver from their ores, and more particularly from ores which, up to the present time, have refused to yield their contained metals by any of the ordinary processes of chlorination or amalgamation. As a description of this new process may prove of more than passing interest to the electrical and mining world, I give it herewith.

The plant is at present set up and in operation at Chelsea, and consists of the following:

A "Wiswell" ore pulverizer; 10 horse power engine and boiler; small Kimball & Davis dynamo electric machine; mecuric bi-chloride generator; mixing tub; amalgamating pan; furnace, retorts, etc., for retorting the amalgam.

This plant, though small, is capable of handling 10 tons of ore per diem of 10 hours, and by increasing the number of mixing tubs, can easily work a much larger amount. The ore pulverizer has been before the public some time and is well known in mining circles, and therefore needs no description.

The mixing tub consists of a vertical iron barrel supporting a framework through which passes a vertical revolving shaft, on the lower portion of which are projecting blades whose object is to intimately mix the pulp and bi-chloride of mercury solution which is placed in the barrel. The shaft is insulated from both framework and barrel, and carries on it a thick composition ring against which presses an ordinary commutator brush to which the positive wire from a small dynamo is attached, thus making the shaft and blades the anode, the barrel, to the bottom of which the negative wire is attached, forming the cathode. From the bottom of the barrel extends a trough for discharging its contents into the amalgamating pan, at the head of the trough being a suitable sluiceway.

The amalgamating pan is of iron, circular in form, and is given a rotary motion by suitable gears and rollers underneath it. A vertical shaft extends upward through the center of the pan, to the upper end of which is attached a framework which serves to support a set of inclined blades for thoroughly mixing the mercury with the pulp; in front of the blades iron balls are placed to assist the process. A trough is provided for disharging the contents of the pan over the pockets, these latter serving to catch the amalgam as it runs off from the pan.

In the mouths of the pockets are placed large copper plates through which a current is passed while the contents of the pan is being discharged; they are called "electric riffles," and their object is to collect any fine gold or chloride of mercury that might otherwise escape.

The bi-chloride of mercury generator is simple and inexpensive in construction, the process of generation being essentially the passage of an electric current through a solution of sodic chloride and hydrochloric acid in which is placed a cup of mercury which is made the anode.

The run I witnessed was made in about 50 minutes, and the operation was as follows:

Four hundred and fifty pounds of pulverized Talcose slate ore from a North Carolina mine was placed in the mixing tub, and a generous quantity of the mercuric bichloride solution added. The shaft extending into the tub was then set revolving and an electric current of about 25 amperes and four and one-half volts turned on, and allowed to remain on for about 15 minutes, during which time the revolving shaft kept the contents of the tub in agitation. The action of the electric current was to set free chlorine, which, being in a nascent state, immediately attacked any particles of gold present, and converted them into the chloride, in which state they were conveyed to the amalgamating pan.

After the time mentioned above had elapsed the revolving shaft was stopped, the current turned off, and the contents of the tub run into the amalgamating pan, in which had been placed 21 pounds of mercury; the pan was set rotating and so continued for half an hour nearly, when it was stopped and its contents discharged over the electric riffles, through which an electric current of the same strength as used on the mixing tub was passing. The amalgam was taken from the pockets and the electric riffles carefully cleaned, and the cleanings added to the amalgam, which was then retorted in the usual manner and the button taken to the assayer for valuation.

The fire assay of this ore averaged about $10 per ton, and the result of this run gave $8.27, which speaks for itself, especially so as by no other process on this ore has it been possible to obtain but little, if any, over $1 per ton. I was shown the results of several other runs made, which gave even more favorable results than the above.

This process has one thing decidedly in its favor, and that is cheapness; the chemicals used are inexpensive and the labor required is slight, while the cost of the whole plant, capable of working 100 tons of ore per day, should not exceed $10,000.

In closing it may be well to state that this process is fully covered by patents which are the property of the "Electric Gold and Silver Chlorination Company," of this city, and who are now getting a large plant ready for shipment to a gold mine near Charlotte, N. C., to illustrate in a practical manner the working of this process.

Very respectfully,
James Blake Cahoon,
Electrical Engineer.

Boston, Mass., Nov. 26th, 1888.

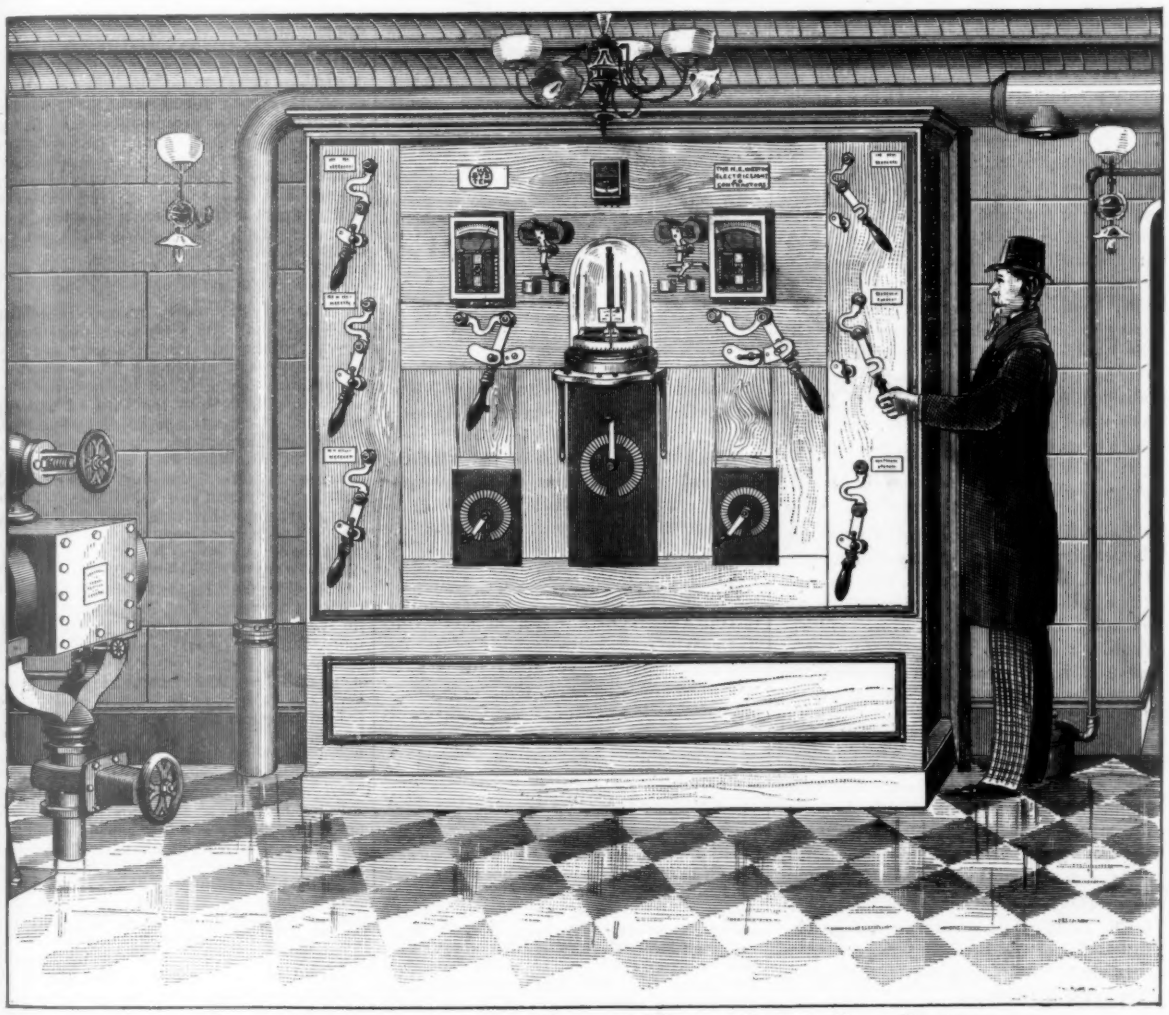


Fig. 2.--View of Switchboard of Equitable Building Electric Light Plant.

—— The Cohoes, N. Y., electric light company plans for a new plant to be erected the coming spring in the ravine just south of the Cataract House. The waterfall at that point is over 90 feet high, which will give the company all the power needed.

Portland, Ore.—Willamette Falls Electric Company, Portland, is incorporated by D. P. Thompson, E. L. Estham, P. F. Morey, R. H. Thompson, L. L. Hawkins, W. R. Smith and J. C. Moreland. The object is the generating, making and transmitting electricity for lighting, and to lease and sell telegraph and telephone wires, sell and lease electrical devices, machines, etc. The capital stock is $1,000,000, which is divided into 10,000 shares of $100 each.

Cincinnati, O.—The Central Electric Matrix Company, of Cincinnati. Capital, $1,000,000. Lowe Emerson and others, incorporators.

Portland, Ore.—The Willamete Falls Electric Company, of Portland. Capital, $1,000,000. D. P. Thompson and others, incorporators.

Merchantville, N. J.—The Merchantville Gas, Light and Fuel Company, Merchantville. Capital, $30,000. Joseph Cooper and others, incorporators.

Chicago, Ill.—Chicago Cork Insulating Company. Capital, $200,000. Incorporators, W. S. Driver, Ambroser Ristin and Robert A. Drummond.

Portland, Me.—The Eastern Electric Construction Company, of Portland. Capital stock, $50,000. G. C. Mosses, Bath, Me., and others, incorporators.

Portland, Me.—The American Fire Alarm Company, of Portland. Capital stock, $20,000. Clarence F. Blackwell, Revere, Mass., and others, incorporators.

Beaver Falls, Pa—The Beaver Electric Light and Power Company, of Beaver Falls. Capital stock, $12,000. W. H. Hartman and others, incorporators.

Oakland, Cal.—The Oakland Electric Light and Motor Company has elected the following board of directors: W. E. Dargie, president; T. W. Cordes, vice-president; D. E Hayes, C. R. Lloyd and H. Lund. H. Lund was re-elected secretary of the company.

Chicago, Ill.—The Illinois and Indiana Phonograph Company, Chicago. Capital, $2,000,000. To control the use of phonographs and graphophones and other speaking instruments. Incorporators, Green B. Raum, Franck Z. Maguire and Joseph Kirkland.

San Francisco, Cal.—The San Francisco Automatic Gaslight Company. Object, to manufacture gas apparatus under patents issued to Louis Marks. Capital stock, $1,000,000. Directors, C. W. Grimm, J. Van Angelbeck, G. Schlessinger, Geo. Buckhardt and Louis Marks.

Omaha, Neb.—The Nebraska Light and Motor Company. Capital, $500,000, divided into shares of $100 each. The incorporators are C. D. Covell, W. S. Mann, Jeff. W. Bedford, T. S. Clarkson, J. J. Wills, Oliver F. Briggs and Edwin H. Walker. The purpose of the company is to manufacture electric light, buy and sell motors, batteries, automatic dynamos, electric ventilators, bells, etc.

North Topeka, Kas.—The charter of the North Topeka Electric Light and Power Company has been filed in the office of Secretary of State, and the company will locate its plant on the north side and furnish light and power as soon as possible. The capital stock is $22,000, and the directors are Hon. H. C. Safford, James Riley, J. M. Smith, William Knox and W. M. Rynerson. Harry Safford is president of the company and W. M. Rynerson is secretary. A building and grounds were secured at a cost of $4,500 on Laurent street, between Kansas avenue and Jackson street. James Riley, one of the leading stockholders and vice-president of the company, will undertake the management, and said that as soon as the building is equipped the new company will compete in arc lights with systems on the south side, while the incandescent lights will be confined to the north side of the river. The company is well organized, says the Topeka *Capital-Commonwealth*, containing among its stockholders some of the most solid and energetic capitalists of the city.

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EDITORIAL ANNOUNCEMENT

Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, DEC. 8, 1888.

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The electric semaphore signal is certainly a striking mechanism, and though we don't know whether or no the present type is really a practical contrivance, it is evident from what has already been done with it that signals along a whole line of railroad may be operated from a single central station, the operator setting the stop signal here, the danger signal there, hurrying up one train and retarding another.

"Slöjd" is the name of a new system of education adopted in Sweden; that department having to do with electricity having all the implements for practical work from the building of a line to the construction of a motor. The London *Lancet* says of it, that the system is likely to spread in the near future, for that the trouble with college-taught folk is that they have no practice, only theory.

A fortunate condition of the electric light industry just now is the really extraordinary freedom from accident. Who does not remember how every mishap started loud and long outbursts from the popular press? Now, notwithstanding the enormous quantity of electrical material in use, accidents are rare, and generally so trivial that the daily press forgets to set its virtuous indignation a-booming.

Electrician Weston's idea of using a thermopile, which is to be placed in the focus of a mirror or lens, and which is to be used to charge a storage battery from which the energy is finally to be drawn, is novel and interesting, even if not just at present practicable. Long since, it was suggested to use Ericsson's solar engine in connection with the dynamo, but as the solar engine is more expensive than the steam engine and only intended for countries like Upper Egypt, where fuel is scarce and costly, the project was abandoned. But there is, we think, the germ of a valuable idea in Mr. Weston's suggestion.

Judge Lawrence will hereafter appreciate the delicate position of a base-ball umpire. He said, last week, after hearing the evidence in the case of the United States Illuminating Company against the Subway Board: "It seems to be your intention to make this court an expert on electricity, though both sides, all experts in the science, disagree." Now, that's just the position of an umpire when both sides claim the game and surround him with clubs, each demanding a decision in its own favor. The mode of procedure under such circumstances, in base-ball usage, is for the umpire to climb a tree, give his decision from the top and then call for the police. Of course, we do not suggest such undignified conduct to the honorable court or to his Honor, Judge Lawrence, one of the best equipped jurists on the Bench. We simply wish to draw attention to the coincidence.

No reasonable person who has read the whole evidence in the matter of the burial of the wires can help feeling a sympathy for the Board of Electrical Control as well as for the companies. With few exceptions, the daily press insist that the wires should be immediately buried and lay the onus of the present state upon the shoulders of the the Board, as two of their number did last week; accusing them, as the *Telegram* did, of "drawing their salaries for not carrying out the law." Should the Board follow the advice so lavishly bestowed upon them and cut down the poles, the city would, practically be left without electrical service and there would go up such a howling from Press and Public as has been perhaps rarely equalled. The first law was mandatory; those who made it were certain that all that was necessary to accomplish the purpose, was to dig a trench in the ground, put the wires in it and fill it up. But wiser counsels, happily for the public, prevailed, and a more reasonable amendment gives the Board power to permit aerial service till an efficient means of carrying it on shall have been provided in the ground.

THE COMING MEANS OF ELECTRIC TRANSIT.

Our English namesake, says: "Anyone who has read the discussion on the Sprague system, can safely come to the conclusion that, although various other systems are worked in America, the practical outcome of all these gigantic works is that storage batteries is the only safe and practical means for street transit."

This judgment, though coming from so authoritative source, would seem to be a little hasty. We do not think it would be safe to so conclude, for just now the various systems are but passing from their embryo state, from incipiency to maturity, and while the storage battery motor is giving evidence of increasing possibilities, the other systems are by no means behind hand, besides gradually discovering fields for which they are especially fitted. Again, our namesake says: "Mr Sprague himself was compelled to admit that accumulators are the only safe means as a motive power for street cars, and are, therefore, to be looked forward to in the future as the solution of the difficulty of electric traction facilities and public thoroughfares."

We cannot find that Mr. Sprague ever made such an admission, and with apologies to our contemporary for the contradiction, we do not believe he did. It would, indeed, be a remarkable one for a man engaged, as he is, in making the apparatus of and building electric railways on the overhead trolley system, and if it were true, those for whom he might offer to construct such a railway might fairly wax indignant at the cutting irony of him who would encumber them with a costly plant of a type he, himself, had acknowledged was inferior.

LARGE ARMATURES.

(BY P. H. VAN DER WEYDE.)

It will be seen from an illustrated article published in last week's issue, that the most recent German improvements in dynamo construction have chiefly been in an enormous increase in the size of the revolving armature, to such a degree even as to make it large enough to perform a double function, namely, that of the flywheel of the driving engine also.

There are several advantages connected with this method of construction; first, it increases the velocity of the armature coils without increasing the number of revolutions; secondly, it gives room for a more economical distribution of the iron in different cores, in place of heaping up enormous masses, not half of which can have any effect upon the coils, nor be affected by them; thirdly, of avoiding a prolific source of heating, so frequently observed to a greater or lesser degree in most dynamos, in which the cooling by radiation and by circulation of air is prevented by that very system of heaping up cores and coils in a small space; fourthly, of making it possible to do away with shafting and belting, without being in the necessity to abolish the large economic steam engines of moderate velocity and construct small engines of extraordinary rapidity; and fifthly, that a moderate velocity retards the wearing out of any machine and also diminishes the labor of attendance.

I ought to inform your readers that the tendency to make very colossal armatures is not confined to Germany alone. The alternating current dynamo of Gérard in France is a large steam engine of 250 horse power, of which the flywheel of 12 feet diameter is the armature, carrying 96 bobbins; it supplies 1,000 arc lamps or 3,000 incandescent lamps. The Gordon generator is still larger, and was constructed by the Telegraph Construction Co., at Greenwich; it has 128 stationary bobbins, acted upon by 64 poles; it weighs 18 tons and gives a current of more than 1,000 amperes.

The Hungarians appear to have labored in the same direction. Gans & Co., of Buda Pesth, have constructed an alternate current generator with steam engine on top. With 140 horse power it supplied more than 1,000 incandescent Swan lamps.

All this appears to have stirred up the capitalists of London, who are preparing a colossal central station, to light up almost the whole of that great city, while it is claimed that it will be the largest station in the world. It is to begin with two 2,000 horse power engines, driving two direct current dynamos for feeding the two alternating dynamos, each driven by a 10,000 horse power engine, of which the flywheel armatures will be 40 feet in diameter, and be able to supply 600,000 incandescent lights. The armatures will be of the kind suggested by Sir William and Alfred Thomson, as constructed by Ferranti, and known under his name. In this dynamo the field magnets are based on the so-called Robert magnets, in which a bundle of copper strips are passed up and down in zig zag shape between iron blocks attached to an iron base. This dynamo was used at the London Aquarium, where, however, the results were very unfavorable, as it developed more heat and waste than most other machines. It is, however, said to be so greatly improved that it will now be executed on the colossal scale mentioned above. The projectors of this London central station claim that they will be able to supply 2,000,000 lights from this single station.

OUR CHICAGO LETTER.

(Special Correspondence.)

A special meeting of the Council Finance Committee was held on Friday, November 30th, to consider the telephone company's proposition. Liverymen, publishers and druggists were represented, and the attorney for the company, F. S. Winston, said that the company, anxious to prevent prolonged legislation, was ready to offer still further concessions.

The ordinance which he had prepared for adoption would grant to the city the free use of instruments for all municipal offices: Fire and police departments at nominal prices, and two and a half per cent. on gross receipts. In return for this concession, it asks Council to grant the company the right to extend its wires and operate its system without threats of vexatious litigation or attempt to regulate its rates. Subsequent to the preparation of that ordinance, public opinion had determined the company on even farther concessions. Its proposition now would include a grant of the use of instruments, as already indicated, to the city, and two and a half per cent. without any attempt to exact from the city a waiver of its rights in the matter of rate regulation.

The vital section of the ordinance is as follows.

"SEC. 6. The said Chicago Telephone Company shall file with the Controller of the city on the first day of January and July of each year, a statement of its gross receipts from the telephone business done by said company within the City of Chicago for the six months next preceding such statement, which statement shall be sworn to by the president and secretary of said company; and at the time of filing said statement the company shall pay into the City Treasury two and one-half (2½) per cent. on such gross receipts, and said company shall not increase the rates it is at present charging to its subscribers.

"And the company shall connect its wires with the Mayor's office, Department of Public Works, Fire Department, Police Department, Building Department, City Collector's office, City Clerk's office, Health Department and Law Department, and place and keep one telephone in each of said places free of charge to the city, so that said telephones may be used in connection with all wires under control of said company connected with its exchange in the City of Chicago, and said company shall also rent to the City of Chicago, telephones for the sole use of the police and fire alarm system of the City of Chicago at an annual rental of not to exceed five dollars ($5) per annum for each telephone outfit; provided, however, that nothing in this ordinance contained shall be construed or taken as preventing the City of Chicago, whenever it shall be authorized so to do, from passing an ordinance regulating the rates to be charged by telephone companies for the rental of telephones, or for licensing telephone companies, it being the intention of this ordinance that the City of Chicago shall in no way surrender any rights it may have or may hereafter acquire to license telephone companies or to regulate the prices to be charged for telephones; but upon such licensing, or upon such regulation of such prices, then the provisions of this section as to payment of revenue and furnishing of telephone facilities to the City of Chicago shall cease to be binding upon said company; provided, also, that nothing in this ordinance contained shall be construed as preventing the City of Chicago from granting an ordinance to any other telephone company."

Acceptance of this ordinance means $35,000 revenue to the city, while the corporation surrenders no rights, powers or privileges, pending a final settlement of the question by the legal tribunals.

After argument, discussion and a trifle of loud talk, the committee went into secret session, and ultimately decided by a vote of four to three, to refer the matter back, requesting the council to place the proposition on file, and that a resolution be passed by the council asking the Legislature to empower it to increase the telephone rates.

A minority report will be submitted with the majority report, urging the council to accept the telephone company's proposition, provided the percentage is increased to an amount of five to 8 per cent.

Chicago, December 1, 1888. C. C. H.

OUR BOSTON LETTER.
(Special Correspondence.)

Mr. H. H. Cutler's paper on the "Adaptability of the Alternating System," read before the Electric Club on Wednesday evening, was of unusual interest and greatly enjoyed by those present. Mr. Cutler described clearly the principles of the alternating system and converters, and quoted from personal experience facts and figures sustaining his opinions as to its adaptability and advantages over direct current for lighting over large areas. Incandescent lighting, in Mr. Cutler's opinion, is the field to which electric light companies must look for extending their business in the future. A few words were devoted to lightning arresters and to the different systems of incandescent street lighting with the alternating current. A discussion followed the reading of the paper, in which Messrs. J. C. Wilson, J. T. Moriarty, A. L. Rohrer, J. R. Lovejoy, O. K. Stuart and others took part. It is hoped Mr. Cutler will again favor the club, as in this paper hints were given of much material which lack of time prevented his touching upon. The regular monthly meeting will be held this evening, at which action will be taken on the proposed amendments to the by-laws and the committee on nomination of officers and committees for the ensuing year, consisting of Messrs. Rohrer, Cram, Denver, Dr. Amory and Col. Ransom, will present a report.

Another important removal has just taken place, the N. E. office of the Sawyer-Man Company leaving its old offices in the Hancock Building, 33 Federal street, and taking up commodious quarters on the first floor of the Hathaway Building, 620 Atlantic avenue. The new offices have a frontage on Atlantic avenue, and extend through to the large court in the center of the building. The bookkeepers, Messrs. B. F. Porter and H. C. Bartlett, occupy the front space, which is exceptionally well lighted. Mr. F. E. Alexander, assistant superintendent, also has desk room in the enclosure. Directly opposite the entrance is the office of Mr. William A. Carey, superintendent and electrician, with the draughtsman's table near by. The remaining space in the front office is occupied by the salesmen, Messrs. A. G. McClure, George F. Talcott, E. W. Kellogg and S. S. Sherman. The entire room in the rear is to be used by Mr. P. H. Alexander, the general manager of the office and general agent of the Sawyer-Man Company. Miss K. B. Coles, stenographer, has pleasant quarters, well suited for her work. A telegraph office is conveniently located in the hallway, the company employing their own operator, and using their private lines to New York and Pittsburgh. The stock and supply room occupies the basement, and beside being commodious, is conveniently arranged for receiving and delivering freight. The business done by the Sawyer-Man Company in New England has been increasing very rapidly, 50 men, with 16 or 18 foremen, being constantly kept at work on installations, and new quarters were much needed. The removal was accomplished without serious interruption to business, which is now being carried on with all the advantages which large, well-lighted offices can afford.

Mr. A. F. Mason, of the Simplex Electrical Company, has taken the sale of a new insulating staple, a staple made of insulating fibre, and for which there will inevitably be a very great demand.

Messrs. Dickerman and Adams, the enterprising New England agents for the Eddy electric motors, have already made a large number of installations of these popular variety of motors, among the more recent being one for R. E. Sparrell, of 41 Arch street, of three horse power, which is giving great satisfaction in running a printing office; and a two horse power motor which is pressing drugs for the India Drug Company, of 24 India square, and working very satisfactorily.

Leonidas Le Cenci Hamilton, M. A., lectured at Horticultural Hall, on Friday evening, on the subject: "Electricity and Magnetism—What They Are, Where They Come From," giving his views and results of experiments as already put forth in his book on the "Origin of Energy," and giving some matter which has never yet been published, regarding his theory of the rapid rotation of notices accounting for all electrical and magnetic phenomena, as well as chemical apparatus, propogation of light, etc. The lecture was illustrated by well-known experiments which were, however, all explained by the lecturer's theory, and at the close of his remarks, Mr. Hamilton allowed his audience to question him on any points touched upon.

Messrs. F. E. Pettingell & Co. have found their floor space inadequate, and have taken in the office formerly occupied by the Loomis Electric Company who still retain desk room. This change will give Messrs. Pettingell & Co. much improved facilities for handling their increasing business.

The West End Street Railway Company has been granted permission to maintain the overhead electric system between West Boston bridge and Bowdoin square, Mr. Whitney, the president, agreeing however to substitute the conduit system when it proves successful in other parts of the city. The section covered in this grant is that in which the T.-H. system is being installed.

The N. E. Baxter Electric Manufacturing and Motor Company agency made three motor sales on Friday last, not a bad closing for the closing day of the month.

A trial trip of the Sprague electric car was very satisfactorily made on the Allston and Brookline division of the West End Street Railway, Saturday afternoon. The car made good time and climbed steep grades easily. Mr. F. J. Sprague himself operated the car and frequent stops were made to thoroughly test its starting capacity. On the Beacon street stretch a short spurt was made the car attaining a velocity of over 15 miles an hour. During the afternoon the car was run over nearly all the line so far completed with the overhead system, and the trial trip of the first electric car in Boston, storage battery system excepted, has proved a success very gratifying to the Sprague Electric Motor Company, and to the West End Street Railway Company also.

Boston, Dec. 3, 1888. T. W. S.

OUR WASHINGTON LETTER.
(Special Correspondence.)

On the 26th inst. the first winter storm caused much damage to small wires and developed some points in the new street railroad equipped by the Thomson-Houston Company and opened October 15th. It was not easy to clear the wire of ice, and the passage of one car did not leave it free for the next. At times the groove in the trolley wheel became partially filled with ice, necessitating clearing out. A gusty breeze of 25 miles velocity made it difficult at times to keep the trolley on the wire. The Thomson-Houston representative in charge of it says he will be prepared for the next storm. The Western Union lines suffered severely, all communication with the south having been interrupted, while over half the northern wires were down. The telephone company had over 200 wires down, and four-fifths of the fire alarm telegraph service was disabled for 24 hours. Crosses with dynamo wires caused some confusion, but no serious damage resulted. Two telephone linemen, handling a No. 14 wire while it was in contact with the horse car and wire (the latter carrying a current of 500 volts), received a shock but suffered no permanent ill-effects. The sleet storm was exceedingly light, the disastrous results being due to the continued effects of ice, high wind and sudden cold.

The forthcoming report of the Navy Department to Congress will contain many items of interest. An appropriation of $45,000 will be asked for lighting the Navy Yards at New York, Norfolk and Mare Island. Commander Bradford, the Naval Inspector of Electric Lighting, suggests that both arc and incandescent lamps be used and that, during the day time, the current can be usefully employed in operating small motors. He recommends underground wires, duplicate engines and dynamos and urges that specifications be carefully drawn so as to "exclude the wretched and dangerous materials and workmanship so frequently found in electric light plants." If Mr. Bradford writes the specifications such "exclusion" may be relied upon. Inasmuch as a very considerable portion of the lighting done for the navy has proved unsuccessful, largely from faulty construction, his recommendations are very pertinent. Other appropriations asked for by the Department, either for new plants or for increasing existing ones, are:

For the *Miantonomah*, *Terror* and *Monadnock*, each	$45,000
For the *Baltimore* and *Charleston*, each	2.600
" *Petrel* and *Vesuvius*, each	5.000
" *Vermont*	6.000

The Edison Company is under contract for equipping the *Yorktown*, *Baltimore*, *Charleston* and *Pensacola*. In the new vessels currents will be taken from the lighting dynamos for simultaneous firing of guns. In some cases dynamos on ships have had a disturbing effect on compasses and chronometers and remedies for these difficulties are being devised. On the *Enterprise* the steering compass changed 5° in a four hours' speed trial by unusual heating of the iron funnel near which it was located.

A good specimen of navy construction of lighting plants is the incandescent installation now being put up by the Brush Electric Company in the Interior Department under specifications prepared by Commander Bradford. Habirshaw's wire with special installation runs in painted wooden moulding, brass fastenings, fibre staples, slate bases for switches and cut-outs, a liberal use of hard rubber and iron tubing, and unusually careful and durable work emphasize the excellence of the work. One dynamo, supplying 300 sixteen candle power lamps was started a few days ago. The plant when completed will include two Babcock & Wilcox 61 horse power boilers, two Armington & Sims engines, 35 and 60 horse power respectively, and two Brush dynamos of 300 and 450 lights capacity, with a current of 92 volts and 10 amperes. Each dynamo is fitted with a Schaeffer & Budenberg tachometer. The cost of the plant will be about $9,000, not including the boilers or the small engine.

C. M. McNett, who has looked after the business of the Thomson-Houston Company in this city and Virginia for several years, will leave on the 15th inst., for Los Angeles, Cal., to recuperate his health and assist the company's Pacific agents until May 1st. During his absence C. A. Ballow, the City Engineer of Danville, Va., will represent the company in this vicinity.

The United States Lighting Company is now operating about 350 Thomson-Houston arc lamps, and 4,000 Edison incandescent lamps. It will soon add one 150 horse-power Armington & Sims engine, and two 550-light Edison dynamos, to meet increasing demands from customers. It will gradually introduce Edison meters, and adopt the plan of basing charges on the amount of current used. Mr. Renshaw, the general manager, is also about to try Acheson's protectors. His company is pushing its underground lines in order to complete the season's work by December 1st. The northern extension has reached Wash McLean's new hotel, just before the Treasury, which is wired for 1,000 lamps, and which will shortly be lighted by the company, unless the owner decides to operate a private plant. By the end of the month the company will have completed about two miles of Lake's conduit, which is made of glazed terra cotta pipe, about 12 inches square, divided into six compartments, each two and one-half by four inches. It is made in two-foot lengths, and is laid just below the street pavement, surrounded by a layer of cement and broken stone, with brick manholes, usually 350 feet apart. The cost of this conduit is about $1.70 per lineal foot, which covers all the work connected with laying it. Distributed about in the six compartments are both arc and incandescent wires variously insulated. Grounds, crosses and cases of burnt insulation are frequent.

The recent street railway convention, with all its lengthy and intensely interesting discussion, did not settle many questions for the roads in this city. The leading companies are convinced that horse-power must soon be superseded; some of them are replacing their old tracks with 80-pound rails at double the cost of ordinary rails, in order to be prepared for heavier cars, and all are hoping that the storage battery will soon materialize and become an available thing. Legal complications are now delaying its development. G. C. M.

Washington, Dec. 1, 1888.

The Electric Club—A Number of Fine Dinners.

Mr. E. G. Acheson, the electrician, came over from Pittsburgh last week, and is domiciled at the Club.

President Davis, of the Club, expects to sail for Europe, Saturday of this week, to be absent several months.

The increase in membership still continues, and the daily attendance at the Club is much larger than ever before.

The question of changing the initiation fees and dues of the Club will be voted on at the monthly meeting, December 20.

Five private and elaborate dinners at the Electric Club in one week, and three the week preceding, would indicate the popularity of the Club's *cuisine*.

Mr. J. H. Shay, the alert belting man of Chicago, was in New York last week. He is well pleased with the demand for the belts of Munson & Co. in electric lighting circles both East and West. Mr. Shay was an Electric Club visitor while in New York.

One of the most valued gifts received by the Club was from Mr. Chas. A. Cheever, who presented files of the London *Electrical Review*, London *Electrician* and *English Mechanic*, from 1880 to the present year. These journals comprise interesting records of the rapid growth of electricity during these years.

Major John I. Sabin, of San Francisco, gave one of the most elegant private dinners ever enjoyed at the Electric Club, Wednesday evening of last week. The honored guests were Col. J. J. Dickey and L. H. Korty, of Omaha, and Lieut. F. W. Toppan, U. S. N., Capt. Willard L. Candee and others, of New York. Each guest found a handsomely decorated card at his plate with an appropriate axiom written on it by the donor. These cards and the poem that suddenly turned up beneath the host's plate are mementoes that will long be cherished.

Col. J. J. Dickey and Mr. L. H. Korty, of Omaha, gave a fine banquet at the Electric Club, Friday of last week, to a number of their New York friends. The dinner, which continued from 6 to 10.30, was the most complete ever given at the Club, and the cooking of the rich saddle of Southdown and the tender canvas-back was equal to any ever met with in this great city of fine cooking. When the discussion ventured from the straight path of electrical science, politics and the walking match became interesting topics, and it was discovered that a talented young naval officer present was so greatly interested in the contest of the pedestrians that hourly bulletins came to him reporting the condition of his favorite, which was anything but encouraging. In addition to the New Yorkers, Judge Wolworth, of Omaha, and Major John I. Sabin, of San Francisco, were present.

The Oakland Electric Light Company have made an excellent showing during the past year, the profits of the business showing a gratifying percentage on the capital stock.

The Robinson-Foster Company has leased the Craig Mills property, Peabody, Mass., with the privilege of purchasing, and will at once begin the manufacture of dynamos and electrical supplies.

The new building at the gas works, at Freemont, O., is to be occupied exclusively by the electric light plant. It will consist of an engine of 80 horse power, with new boilers and dynamo.

Packard & Grover, shoe manufacturers of Brockton, Mass., will run their entire factory by electricity. Power will be furnished from the Edison central electric lighting station, and all the machinery will be operated from that plant.

There was a slight fire caused by the ignition of gasolene in the carbon building so-called of the Thomson-Houston Company at Lynn, on Wednesday morning. It was extinguished by employés very promptly before the regular fire department arrived on the scene.

Mr. Down, of Laing, Wharton & Down, representatives of the Thomson-Houston Electric Light Company for Great Britain, with headquarters at 82 New Bond St., London, England, who is on a tour of inspection in the electrical field in this country, paid the REVIEW a visit last week.

Telephonic News

*** Telephoning by phonographs is a new method of transmitting speech.

*** Judge Blodgett has denied the petition of the American Cushman Telephone Co. for a rehearing of its case against the American Bell Telephone.

*** The electric system of the Third Ward Railway Company, of Syracuse, N. Y., has been tried and found to work satisfactorily. A car was run about half a mile in Park Avenue. The road will soon be ready for operation.

*** The Visual Synchronism Co., with a capital stock of $3,000,000, in $25 shares, has been organized under the laws of West Virginia; Charles H. Lawrence, president, and O. R. Glover, secretary, to exploit the synchronism inventions of J. Harris Rogers.

*** R. M. Bailey, Esq., general manager of the Central Pennsylvania Telephone and Supply Company, of Williamsport, Pa., sends the following item: "In the case of the borough of Philipsburg, Centre County, Pa., which attempted, by ordinance, to levy a tax or license of $1.00 per pole, per annum, against the Central Pennsylvania Telephone and Supply Company and which was resisted by the latter, a decision on a 'case stated' was rendered Nov. 19th inst., by President Judge A. O. Furst, in the Court of Common Pleas of Centre County, in favor of the telephone company, and adverse to the borough with costs of suit."

A Suggestion from Kansas.

TOPEKA, KAS., Nov. 21.—The complete official returns of the State make the vote as follows: Harrison, 182,356; Cleveland, 102,725; plurality for Harrison, 79,631.

The above being taken as an indication that the Republicans have voted all they wanted to, Mr. T. B. Doolittle of the American Bell Company will resume his trip through that State. W. W. S.

A Victory for the Bell Telephone.

CHICAGO, Dec. 1.—At the instance of the Bell Telephone Company, Judge Blodgett, in the United States District Court, to-day refused to give the Interstate Telephone Company further time in which to prepare their defence to charges of infringing on the rights and patents of the Bell Company, and issued perpetual injunction restraining them from further action.

Western Union Swallows Another Company.

ST. LOUIS, Dec. 1.—At noon to-day the Western Union Telegraph Company took possession of the Atchison, Topeka and Santa Fé Telegraph Company's lines, and announced at once a reduction in rates to all points covered by the new line. There are about 3,000 miles of telegraph in the Santa Fé system, and nearly two-thirds of it is in Texas and the Indian Territory. It is said the absorption will help Texas and result in a more efficient service.

Life Saving Telephones.

About two years ago the Treasury Department Life Saving Service commenced a system of coast lines which now connect 25 stations between Cape Henry and Hatteras Inlet, N. C.; nine stations between Lewes, Del. and Assateague Beach and 23 stations along the New Jersey coast from Sandy Hook to Barnegat. The stations at Erie, Pa., Cleveland, Ohio, Manistee, Mich. and some other places are connected with the nearest telephone exchange by wires belonging to the government. A survey has been made of the Long Island coast with a view of constructing lines next spring, which will connect 37 stations including those on Block Island, and at the same time, a line will be run along the coast of Cape Cod. It is also intended to commence work on lines along the lakes beginning on Lake Superior with White Fish Point, Vermillion Point, Crisps, Heart River and Muskallonge Lake. The system is to be extended until all the stations are reached. It has proved of great importance to the service. This is the only system of the kind in existence, in fact, the United States is the only government which has a life saving establishment of any consequence, this bureau having been organized and perfected by Sumner I. Kimball, who is the present Superintendent.

The Long Distance Telephone Perfected for Commercial Purposes.

Yesterday afternoon several newspaper men sat in a little room on Devonshire street and conversed quietly with gentlemen in New York, Buffalo, Philadelphia and other cities nearer home, says the Boston *Journal*. Their voices were not raised to a higher pitch than it required in ordinary conversation. In fact there was no change in the tones when the words were addressed to persons in the same room. The *Journal* reporter carried on a conversation with a friend in the office of the New York *Sun*. Every inflection of voice was heard, and the tones were readily distinguished over the two hundred miles of wire. This courtesy was accorded the reporters by the management of the Long Distance Telephone service connected with the American Telephone and Telegraph Company, who wished to give them a practical example of the commercial value of long distance telephoning, which is now perfected for general use. The system is not new in Boston, but until recently it was not in shape for general use. Now the plant is well established, and a perfect system of loops or double wires is in working order between Boston, Philadelphia, Buffalo, Syracuse and all the large cities in New England. There are four public stations in this city—at 53 Devonshire streeet, 50 Pearl street, 42 Summer street and at the Adams House.

The Telephone Patrons of Poughkeepsie Act Like Sensible Business Men.

At a meeting of the Board of Trade, of Poughkeepsie, N. Y., recently, the committee appointed at the meeting of citizens, held at the parlors of the Young Men's Christian Association, for the purpose of obtaining some relief for dissatisfaction with the telephone service, reported as follows:

That in accordance with instruction they sought an interview with the Hudson River Telephone Company through their principal officers, Mr. A. B. Uline, of Albany, the president, and Mr. H. L. Storke, of New York, the secretary and treasurer. These gentlemen wrote your committee promptly that they would come to Poughkeepsie, but were unable to do so until within the last two days.

The Telephone Company claim that the increase in the charge for the use of the instruments has been made from the intention on their part to make certain improvements, because it was impossible for them to render efficient service with the plant they formerly had here. Within the last two or three months they have made a number of notable improvements, the principal of which consist in a new switchboard in their general office, and a cable containing 50 wires suspended along Market St., and ending at the commencement of South Avenue.

The company promise that they will extend this cable system through most of its principal thoroughfares, and that then communication will be very much less liable to interruption, and the sound transmitted will be received with much more clearness.

The company furthermore promise that no reasonable ground for dissatisfaction shall hereafter exist during any considerable length of time, but that all complaints to the head of the office here shall receive prompt attention, and a conscientious effort be made to remedy at once defects as they may occur.

The Telephone Company, on their own behalf, say that absolutely perfect service is as yet impossible, but they guarantee that whatever may be shall be done to render the service in this city as perfect as present advancement of the science of telephoning will warrant the customers in expecting.

Their officers also say that they will deny any application from the citizens of Poughkeepsie for a diminution in their present charge for the service. They say that all the cities served by this company pay the same rates as are paid here for similar service,—in fact that no city within this circuit, no matter what its size, receives the use of their instruments for a less monthly rental.

In Albany, and some other places of larger size, the charge is greater. They further add that the present prices,—that, $3.50 to private residences, and $4 per month to business houses, are as low as any company would be justified in renting the instruments, and in support of this, alleges that each instrument in use in this city costs the company $38 annually, every item of expense included. But the company gave to your Committee a verbal guaranty that no increase would be made in the present charges during the next five years, and stated that after the lapse of that period, the original telephone patent will have expired, and users of the instruments may then hope for a material reduction in the present rates.

After further remarks by Mr. Gaines, in which he said he was satisfied that the profit on the advanced rate was not excessive, and that Newburgh paid $3 for residences and $4 for business places, the report was accepted.

Mr. Bartlett said the ultimatum of the Company was that the people must pay the advance rate or do without. He moved that the paper signed by a number of persons to give up the telephone unless the rate was lowered, be destroyed, which was carried.

The meeting then adjourned.

The Throat Telephone.

The Lowth stettio-telephone hails from Chicago, and is a combined transmitter and receiver. A hollow extension about four inches long is attached to the receiver, from the end of which a small button protrudes slightly. This button is placed against the throat near the vocal cords, and the receiver is held against the ear in the usual manner, and shown in the cut on this page. When the operator speaks the vibrations of the throat are transmitted, with, it is said, distinct clearness. The instrument is operated by the muscular vibrations that accompany the utterance of words.

The inventor, James Lowth, is said to have been experimenting and working on this instrument for over ten years. When he first applied for a patent, three years ago, the authorities at Washington thought him a crank and refused to issue one. He attached the instrument to wires in the office and asked over it: "What do you think now?" Back over the wire came, "I give in. It works perfectly."

Our Chicago informant says it has been successfully operated between that city and Milwaukee, and in Pittsburg it worked over a line 75 miles in length on which were 25 Bell instruments.

The Storage Battery Came to the Rescue of the Dinner Party.

Owing to an accident to the steam plant in the residence of J. Pierpont Morgan, 36th street and Madison avenue, New York City, several weeks ago, he was left without any means of illumination except candles, gas having been abolished some time previously, and as he expected to give a large dinner party the following evening it was necessary to take prompt measures to remedy the defect. The Electrical Accumulator Company having a supply of accumulators for temporary lighting began the work of charging them at four o'clock in the afternoon, finishing at 12 o'clock, noon, on the next day. The accumulators (60 "15A" type) were then placed in crates, loaded on trucks and carted from the Newark factory to Mr. Morgan's house (10 miles), set up, with necessary switches and appliances, and at six o'clock the light was turned on; thus supplying Mr. Morgan with electric light in ample time for his entertainment. He has expressed himself as greatly pleased with the success of the experiment, and has now arranged for a permanent installation of accumulators as an adjunct to the Edison direct lighting plant, thus supplying him with means of illumination during such periods of time as the direct service from any cause may not be available, and also on special occasions, such as entertainments, etc., when all or nearly all of the lamps in the house may be required, and which latter contingency could not otherwise be provided for except by the use of a larger dynamo.

Electrical Subway Work in New York City.

The daily moulders of public opinion in New York have persistently called for the immediate burial of all electric wires, and pooh-poohed the idea that there were any great difficulties in way. We confess to a little surprise, therefore, in finding the following in the columns of the *Evening Sun* of Nov. 27th, 1888, and that our readers may be made aware that even the New York newspaper man is now willing to admit that the problem is not easily solved we publish the article at length:

The operations of the Board of Electrical Control, so far as the building of any more useless conduits for underground telegraph, telephone, and electric light wires is concerned, have been suspended until next spring. It had been intended to continue this work for a few weeks longer, but winter has most appropriately and fortunately stepped in with an effectual protest.

It has been charged repeatedly that the Board is incompetent to cope with the great problem for the solution of which it was especially created; that there was corruption in its organization, and that its existence has been one continued scandal. Whether these charges are true may be determined by an examination of the record made by the Commission during its career.

In the first place the existence of the Board was due to a popular demand for the removal of the unsightly, obstructive and dangerous mass of wires forming a veritable network over the city. The chief end and aim, therefore, in the creation of a Subway Commission was the transfer of these wires from the air to the earth. For three years and more the Board of Electrical Control has been at work on this problem, and to-day there are actually more wires overhead than there were when the work began. The nuisance that it was intended should be abated or eradicated has actually been aggravated. For three years the streets of the city have been torn up, travel has been impeded, and the public put to no end of inconvenience, but the people bore these grievances good-naturedly in the belief that an effective underground electric system was being established in the city, and everybody was willing to put up with one nuisance in order to be rid of another that was greater.

A more or less elaborate system of subways has been established, but the wires remain overhead, as they are likely to do for a long time to come. That the subway system is not a success is shown by the fact that there are but few wires in it, a large proportion of which will not work satisfactorily. This of itself answers and sustains the charge of incompetency. The Board has failed to do the very thing which it was appointed to do. No one who is informed as to the condition of the subways can doubt that much of the work already done will have to be done over again before the conduits can come into general use. This will involve tearing open the streets once more, with all the unsightliness and inconvenience through which a patient community has already passed.

The following list of subways will show the extent of the work done by the Board, and serve as well to demonstrate the seriousness of any error likely to involve reconstruction: Broadway, from Bowling Green to Fifth-eighth street; New Church street, from Exchange alley to Barclay street; Barclay street, from Church street to College place; College place, from Barclay to Chambers streets; West Broadway, from Chambers to Canal streets; South Fifth avenue, from Canal to Fourth streets; Fourth street, from South Fifth to Sixth avenues; Sixth avenue, from Fourth to Fifty-eighth streets; Eighth avenue, from Forty-second to Fifty-eighth streets; Madison avenue, from Twenty-third to Fifty-ninth streets; Lexington avenue, from Fifty-eighth to Sixty-fifth streets; Spring street, from Broadway to West street; Houston street, from Broadway to Christie street; Houston street, from Green to Bedford streets; Eighteenth street, from First to Seventh avenues; Twenty-third street, from Broadway to Madison avenue; Thirty-eighth street, from Lexington to Sixth avenues, and Broadway to Eighth avenue; Forty-second street, from Broadway to Madison avenue; Forty-fifth street, from Vanderbilt to Fifth avenues, and Fifthto Sixth avenues; Fifty-eighth street, from Third to Eighth avenues; Battery place, from Greenwich street to Bowling Green, along Bowling Green to Whitehall street, along Whitehall to Pearl street; Stone street, from Whitehall street to Hanover square; Broad street, from Water street to Exchange place, through Exchange place, from Broad to Church streets; William street, from Exchange place to Front street, along Front to Gouverneur street; Pearl street, from Hanover square to Dover street; Maiden lane, from Front street to Broadway and Cortlandt street, along Cortlandt to West street; John street, from Nassau to Front streets; Nassau street, from John to Ann streets, along Ann to Gold streets, and along Gold to Beekman

street; Frankfort street, from Park place to Pearl street; Park row, from Ann to New Chambers street; Centre street, from Duane to Worth, along Worth to Chatham square and New Bowery, and along New Bowery to Chambers street. There are arc light and power conductors on Sixth avenue, from Eighteenth to Fifty-ninth streets; Broadway, from Fourteenth to Fifty-eighth streets; Nineteenth street, from Broadway to Sixth avenue; Twenty-first street, from Broadway to Fifth avenue; Twenty-third street, from Fourth to Sixth avenue; Twenth-fourth street, from Broadway to Sixth avenue; Twenth-fifth street, from Broadway to Sixth avenue; Twenth-sixth street, from Broadway to Sixth avenue; Twenty-seventh street, from Madison avenue to Broadway, and from Broadway to Sixth avenue and Twenty-eighth street, and from Broadway to Sixth avenue.

The above include all of the various styles of conduits put down by direction of the Board at different times. They range from two ducts to 16 in each conduit, those with the larger number being placed in localities where the most extensive facilities are required. The total capacity of the entire conduit system is estimated at nearly 30,000 miles of single conductors, or quite enough to accommodate in cables every wire now on poles or housetops in those portions of the city through which they run.

It is estimated that there have been placed in these conduits by the telegraph and telephone companies 6,000 miles of single wire conductors. Of this amount not over 600 miles are in operation. These 600 miles represent the two Sixth avenue cables of the Metropolitan Telephone Company, each of which contains 102 conductors. These are the only underground wires being operated in the subways built under the direction of the Board. The entire down-town section of the underground system has been abandoned, and every cable laid by the Western Union Telegraph Company in other than its own conduits has been given up as useless. It is an astonishing fact that the Western Union is not to-day operating an inch of wire in any subway built under the direction of the Commissioners.

It had cables running from Dey street to the Stock, Cotton and Produce Exchanges, and from Dey street to the Brooklyn Bridge, but all of them gave out because the subways did not protect them.

The claim is made that the steam pipes in the down-town section of the city are responsible for the failure of the subways in that locality. It is conceded generally that these pipes have had a share in the trouble, but cables have been destroyed in other localities by the action of gases from sewers and illuminating gas mains which accumulated in the conduits. Instead of having been a protection to the cables the conduits as constructed have become storage places for the very elements which most effectively destroy the cables themselves.

As a result of the failure of the cables in the business section, the telegraph and telephone companies have been compelled to string new overhead wires to meet the constantly growing demand for increased facilities. Thus, the failure of the subways has been followed by an aggravation of the original trouble which they were intended to remedy. There is not a single mile of electric light wire, either arc or incandescent, in operation in any of the subways of the Board of Electrical Control. The Brush Company, whose high tension wires are generally considered to be the most dangerous of those now overhead, is experimenting with a mile or so of cable on Broadway, north of 14th street, with some promise of success.

It will take months, however, and possibly years, to prove whether the system of conduit and cables will be available for arc lighting. The Edison Company uses its own conduit, and its wires are working underground perfectly. A distributing system is an essential factor in incandescent and arc lighting, and as the Board of Electrical Control made no provision for distribution when its subways were laid, the Edison Company was allowed to place its conduit in the subway trenches on top of the Board's conduits. The omission of a provision for distribution was a costly error on the part of the Board, and to repair it the Johnstone distributing system is being added to the subways. This is an iron box with ducts to correspond with conduits beneath.

To effect distribution a cable may be drawn from a conduit into one of the ducts of the distributing box and wires can then be passed through hand-holes placed in front of each house where current is desired. The box is itself a conduit, and if provided with sufficient ducts could entirely replace the subways beneath. This distributing system has worked fairly well in Philadelphia, but its success here has yet to be demonstrated. It is claimed by some experts that the iron box will leak, just as the iron pipes in the subways have, and become receptacles for insulation destroying gases. These experts assert that iron is not a successful conduit, unless the entire space between the cables and pipe can be filled with solid insulation so as to prevent the introduction of moisture and gases. This is a provision that was not thought of in the construction of the present subway system.

Or, if the companies do not consider the subways effective, they simply do not put their wires into them. The officers of all the companies protest that they are anxious to put their wires underground and declare that they will do so as soon as proper subways are prepared for their reception. They have no confidence in the present conduits, however, and have no disposition to sink more money in burying expensive cables in worthless subways. If, as the Board of Electrical Control claims, the subways are in perfect condition, people might reasonably ask why the companies are not compelled to use them. In the meantime the overhead wire nuisance continues and will continue just the same.

Manufacturing Notes.

The Central Electric Company, Chicago, is one of the most successful of the newer electrical organizations, and is winning the success that will always follow where industry and ability go hand in hand. This company has also been a believer in the value of printer's ink, and the returns from its judicious advertising have been large. The REVIEW is pleased to compliment the energetic McKinlock Bros. on the business they have built up for the Central Company.

The adaptibility of the Schenck belt holder and shifter to any belt, on account of its being entirely independent of the shaft, is resulting in its adoption in many electric light plants, as in many cases it can be placed at driving wheel of engine. The inquiries from abroad, where this invention is also patented, are increasing and evidently the columns of American electrical journals are well read and appreciated.

It would be well for intending purchasers of engines to send for one of the illustrated catalogues of the Ball automatic cut-off high speed engines issued by the Ball Engine Company, of Erie, Pa. In addition to a concise description of the more important details of the engine, the catalogue contains a deal of information. The demand for this most excellent engine is constantly increasing, so that the large works of the company are running to their full capacity both night and day. Among the recent shipments are:

The California Electric Light Co., of San Francisco, Cal., two 80 h. p. engines; The Xenia Electric Light Co., Xenia, O., one 40 h. p. engine; The Pittsburg Traction Co., Pittsburg, Pa., one 25 h. p. engine; Richard Webber, New York City, one 80 h. p. engine; The Cascade Milling Co., Sioux Falls, Dak., one 80 h. p. engine; R. P Francis, Hoboken, N. J., one 80 h. p. engine; Lynn Gas Light Co., Lynn, Mass., one 100 h. p. engine; The Danvers Electric Light Co., Danvers, Mass., one 60 h. p. engine; John Wanamaker, Chelton Hills, Pa., one 60 h. p. engine; The City Gas Light Co., Norfolk, Va., one 80 h. p. engine; Northern Pacific Railway Co., Martin, W. T., one 60 h. p. engine; The Merced Electric Light Co., Merced, Cal., one 25 h. p. engine; Woodward & Lothrop, Washington, D. C., one 35 h. p. engine; The Edison Electric Light Co., Erie, Pa., two 100 h. p. engines; Aultman Miller Co., Akron, O., one 50 h. p. engine; The Morgan Engineering Co., Alliance, O., one 50 h. p. engine; Wm. Cameron Bros., Petersburg, Va., one 60 h. p. engine; Thomson-Houston Electric Co., Brunswick, Ga., one 80 h. p. engine; H. F. Watson Paper Mill, Erie, Pa., two 100 h. p. engines; T. P. Conard, Esq., Philadelphia, Pa., two 35 h. p. engines; Eckington & S. Home Electric Street Railway Co., Washington, D. C, one 100 h. p. engine; Smith, Grey & Co., New York City, one 100 h. p. engine; The Jenney Electric Co., Topeka, Kas., one 80 h. p. engine; Austin Water Light & Power Co., Austin, Texas, two 150 h. p. engines; C. L. Robertson, Esq., Princeton, N. J., one 25 h. p. engine; The Fremont Electric Light Co., Fremont, O., one 100 h. p. engine; Territorial Penitentiary, Walla Walla, W. T., one 60 h. p. engine; The Toledo Electric Co., Toledo, O., one 100 h. p. engine; Snohomish Electric Light Co., Snohomish, W. T., one 35 h. p. engine; The Glasgow Co., Holyoke, Mass., one 100 h. p. engine; Excelsior Electric Co., New York, N. Y., 235 h. p. of engines.

The improved long carbon incandescent lamps of the Westinghouse Electric Company were given to the market early last spring. One of these lamps was procured by a gentleman residing in the St. Charles Hotel. To test the life of the lamp he kept it burning almost continually, at the same time noting the number of hours. In the beginning of August the record was nearly 2,000 hours. The lamp is still in use although the gentleman has ceased to keep its record. No signs of deterioration are reported.

The Midland Electric Company have recently put in a large Edison incandescent installation at Norfolk and Sioux Falls, and also have built an electric railway line between Council Bluffs and Omaha. This company is doing the largest amount of electrical construction work between the Missouri and the Rockies, besides the manufacture of electrical supplies. Col. John J. Dickey is the president of the company, L. H. Korty, treasurer, and H. J. Wells, secretary and general manager.

NOTES FROM ATLANTA, GA.

(Special Correspondence.)

Mr. T. M. Bishop, Manager of Telephone Exchange, Athens, Ga., died here last week of typhoid fever, and was buried at Decatur, Ga.

Mr. Wm. Ryan, Manager Telephone Exchange, Anniston, Ala., was in this city seeing the sights, Sunday, November 18th.

Mr. D. I. Carson, General Superintendent Southern Bell Telegraph and Telephone Company, was in Atlanta, November 21st and 22d.

Mr. A. O. Morgan, Special Agent of the American Bell Telephone Company, was registered at the Kimball House November 21st.

Mr. Alexander McDonald, formerly Manager of Telephone Exchange, Iverness, Scotland, has accepted a position as inspector for Atlanta Exchange.

The City Council, of Atlanta, has just closed a contract with the Georgia Electric Light Co., using the T.-H. System, for 150 arc lights of 2,000 c. p., and 400 series incandescent lights of 32 c. p., each for $30,000 per annum on a three years' contract, which replaced every gas and gasoline lamp in the city and will leave Atlanta lighted entirely by electricity.

Mr. N. R. Frary, of the American Telephone and Telegraph Co., is spending some days in this city, and it is rumored that he may make some real estate investments.

Mr. W. R. Polk, has resigned his position with the Telephone Co., and has started an electrical repair shop, his principal business being repairing of dynamos and motors. He has put in a three h. p. steam engine, fine lathe, with plenty of shafting for other machinery. G. O.

Atlanta, Ga., Nov. 26.

Notes on Some Electric Street Railways.

The month of November has seen a vast increase among the electric railways in operation in this country, a great many new ones having been put into operation, and a large number of those which have been in operation having ordered additional equipments.

The electric railway installed by the Sprague Company at Akron, Ohio, has been in operation now for about four weeks, and has been attracting attention among the street railway men in that section of the country. The cars run very smoothly, are under perfect control, and, as shown by recent experiments, can be started and stopped more readily than cars driven by any other power. The citizens of Akron are very much pleased with the electrical equipment installed in that city, and numerous petitions have been received by the management from residents in different sections of Akron, asking that the road be extended in their direction in the coming spring.

The electric railway installed at Davenport, Iowa, upon the Sprague system has been in operation for about the same length of time as that at Akron, and the president and directors of the road express themselves as very well pleased with their apparatus. It is a significant fact, of the confidence which the directors of this road feel in their electrical apparatus, that upon the date of opening the road, all the horses owned by the company were advertised for sale. The number of motor cars on this road were eight, of the latest Sprague design and pattern.

The Sprague Electrical Railway in operation at Wilmington, Del., has been working very successfully since its installation, and the management of the road feel so well satisfied with its operation that they have written a letter to the Sprague Company expressing their entire satisfaction, and have given orders for an additional number of cars.

The Sprague Electric Railway, to be installed at Cleveland, Ohio, is being pushed forward as rapidly as possible. The overhead system on Euclid avenue, has now been completed, and President Everett of the road hopes to have all the cars in operation within a few weeks. The first portion of the equipment ordered by this street car company includes 16 motor cars of the latest design and pattern.

The ability of an electric railway to be successfully operated, even under the most adverse conditions of weather, was fully demonstrated in St. Joseph, Mo., during the great snow storm in that city of November 9th. The cars run regularly without stop.

TELEGRAPHIC

.... The new fire alarm of Mobile Ala., has been put in operation and gives satisfaction.

.... Henry Seaton and Robert Ackertson, each about 18 years old, were caught breaking telegraph insulators along the Delaware, Lackawanna & Western Railroad and taken before an alderman, where they were fined $10. The penalty for wilfully damaging telegraph lines is two years at hard labor. The telegraph and railroad companies have suffered great loss from the breaking of insulators by vicious boys in the neighborhood of the Delaware, Lackawanna & Western Railroad, and have taken steps to arrest and punish the young vandals.

.... A London cable message says: An important representative conference of Canadians and Australians was held to-day to consider the proposal for a Pacific Telegraph Company to lay a cable from Vancouver to Australia and reduce the tariff between England and Australia to four shillings per word. Earl Winchester, the chairman, dwelt on the requisites of cheapness, continuity and safety in any cable line. He pointed out that the present route has not those advantages. Sir Donald Smith moved a resolution approving the proposal and urging the government to assist the scheme by obtaining soundings as speedily as possible. This was heartily supported by all present and carried unanimously. The proposed route from Vancouver to Australia is by way of Hawaii, Fanning Island, Samoa, Fiji and New Zealand.

.... There was quite a large attendance at the regular monthly meeting of the Civil Engineers' Club, in their rooms at Case block last evening, says the Cleveland *Leader*, of Nov. 14. Mr. John Whitelaw called the meeting to order and presided. There was no preliminary business and the club listened to an interesting paper by Mr. N. S. Possons, superintendent of the Brush Electric Light Company, entitled: "Recent Applications of Electricity." It was an admirable paper, and showed much thought on the subject. Mr. Possons said that the study of electricity was an unbounded field, and gave a history of the discovery of electric currents. He explained the tension of the current and its resistance, and led on to Faraday, who invented the dynamo machine. He then spoke of Mr. Brush and his lamps. The speaker gave the entire history of the manufacture of carbon, and said that on account of it being a very delicate business, girls and young people are mostly employed. The paper was warmly received, and it was thoroughly discussed, during which many interesting points were brought out. The meeting was one of the most interesting held in several months.

.... The Postal Telegraph Company is defending a $10,000 damage suit in Judge Baker's Court, brought against it by C. D. Lathrop & Company, who claim they lost $8,000 through the telegraph company's blunders.

In June, 1887, L. & Co. claim they wired Crossman & Brother, of New York, to buy 1,000 bags of coffee. They say they supplemented that dispatch with: "Please buy in addition to thousand August, thousand cheapest month."

When this dispatch reached Crossman & Brother it read, so they state: "Please buy in addition two thousand August, thousand cheapest month."

Crossman & Brother bought 3,000 instead of 1,000 bags, and L. & Co. claim they lost $4,000.

June 17 Lathrop & Company claim to have sent this to Crossman & Brother: "Put stop order on 5,000 December at 17 cents," meaning sell 5,000 bags when prices reached 17 cents. Lathrop & Company say 17 was substituted by 70, and C. & Co. wired back they did not understand. Meantime, 5,000 bags were closed out at 16.55, and this made a loss of $4,000.

The defense is that Lathrop & Company were dealing in options; that such transactions are gambling deals, and the company cannot be held responsible.

The Electric Railway at Lynn.

It will be remembered that the first electric railway constructed by the Thomson-Houston Electric Company, was one built at Crescent Beach, Mass., for the Lynn and Boston Railway Company at the beginning of the summer. Although this road is but one mile in length and operated but one car, it was enough to convince the owners that the apparatus furnished by the Thomson-Houston Company was capable of doing the work required of it to the satisfaction of the most critical. The success of the Crescent Beach road led the company to contract with the Thomson-Houston Company for the complete equipment at Lynn of the belt line of their road, more than two-thirds of which consists of heavy grades and curves. Starting in one of the busiest portions of Lynn, the road passes out through Union street on an easy ascent, and a sharp curve brings it to Ireson street, where it encounters an increasing grade, combined with a reversed curve on Essex street. The road then goes through Rockaway street, where there occurs one of the steepest grades on the circuit, having a rise of eight feet in 100. From here the path of the road lies through Hollingsworth and Herbert streets which contain sharp curves, with slight grades. Passing into High Rock street, a grade of nearly 12 per cent. is met, on which occurs one of the sharpest curves on the entire road. From Rogers avenue through Essex and Market streets the road is comparatively level to the starting point.

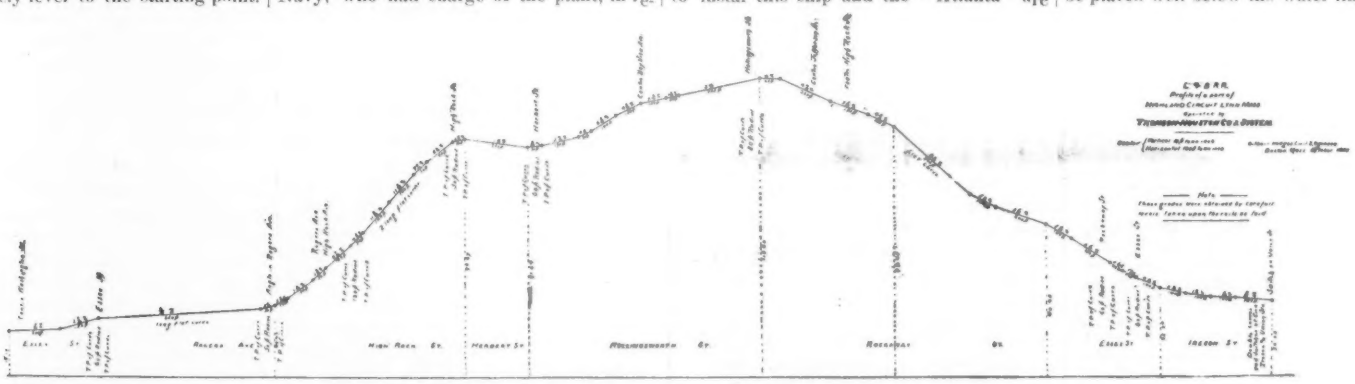

FIG. 1.—PROFILE OF CIRCUIT OF ELECTRIC RAILWAY AT LYNN, MASS.

Previous to the starting of the electric car, horses had been used on this line, and on the grades which the electric car easily climbs with full load of passengers, four horses with great difficulty pulled the car with small loads. Any casual observer cannot fail to be impressed with the unobtrusiveness of the overhead wires, and the thoroughly workmanlike manner in which the construction has been done, although it must be seen from the accompanying drawings that problems of no mean magnitude were encountered and solved by the electrical engineer of the Thomson-Houston Company. The line is at present operated as a belt line, and although the direction of the cars is down the steep grade, it can be easily surmounted in the other direction, as was shown on Tuesday the 20th, when, before your representative, the trolley was reversed at the bottom of the High Rock street hill, which the car ascended with perfect ease. The Lynn and Boston Railway Company, which is operating this electric system, controls 50 miles of street railroad, extending from Boston to Marblehead; and if the system proves as successful as it now gives every promise of doing, both in the Crescent Beach and new Belt lines, it will undoubtedly spread over a large portion of this extensive mileage, and afford an excellent example of the advantages of electric over other forms of street car propulsion. The officers of the company are Mr. Amos F. Breed, president; E. F. Oliver, treasurer, and Elwin C. Foster, superintendent. The accompanying illustrations show Fig. 1, the plan of the road; Fig. 2, its profile, and Fig. 3, view of the car on the grade.

The shut down mentioned last week, caused by a broken axle and having nothing whatever to do with the electrical equipment, was but temporary, as a Thomson-Houston truck was substituted for the broken one, which was supplied by the railway company, and the car put in commission again. During the heavy storm the company was obliged to put all its available men clearing the tracks in the business portion of the city, but on a section which was cleared Sunday the car was run with perfect ease.

Electric Light in the Navy.

Lieutenant-Commander R. B. Bradford, U.S.N., Naval Inspector of Electric Lighting, has made his report to the Chief of the Bureau of Navigation. We publish it in full:

In obedience to your order I have the honor to submit the following annual report containing a brief summary of the work performed under the supervision of this office:

"The Trenton."—The plant of this ship, as described in my report of last year, has continued to perform excellent service. On one occasion the engine and dynamo were run fifteen days without stopping. The total number of lamps has been increased to 300, as follows: 193 of 10-candle power; 101 of 16-candle power, and 6 of 32-candle power.

"The Omaha."—The ship was originally installed early in 1885 by the Consolidated Electric Lighting Company, of New York, with a shunt-wound 75 volt and 85 ampere Sawyer-Man dynamo, a 9½ by 12-inch Armington & Sims horizontal engine, and 156 16-candle power Sawyer-Man lamps. Wire, insulated with paraffined cotton, and then covered with lead, was used. In many instances this was secured by using iron staples. The dynamo was driven by means of a counter-shaft and belting. The three years' cruise of this ship terminated during the past year, and the general performance of her plant may now be briefly stated. Although the plant was generally run only from sunset to midnight, and there was a spare armature on board, the construction of the dynamo was so faulty that it was with extreme difficulty that it was kept serviceable for three years. The spindles of both armatures broke short off and were repaired. The insulation of both armatures proved to be faulty. A clever piece of work was performed on board under the direction of Ensign H. G. Dresel, U. S. Navy, who had charge of the plant, in rewinding one of the armatures. The lamp sockets proved faulty in the switch arrrangements for turning off and on. The lamp wires were exposed and sometimes corroded off. The iron staples in many instances indented the lead cover of the conductors and caused a leak. The paraffined cotton proved totally inadequate as an insulator, and it goes without saying that with such an insulating substance a lead cover does more harm than good. The "Omaha" was recommissioned at Panama for further service in China. A large amount of electric lighting supplies were purchased for her and shipped to that port. They consisted of a new 75-volt and 128-ampere Thomson-Houston compound wound dynamo with spare armature, a large amount of rubber insulated lead-covered wire, new lamps, sockets, volt and ampere meters, testing generator, a Weston 2,000-candle power arc lamp, cut-outs, fusible strips, and numerous other small supplies. Lieut. J. B. Murdock, U. S. Navy, an eminent electrician and a very energetic officer, being ordered to the "Omaha" for duty, had charge of installing the new plant. The old dynamo was shipped to New York; the new one was hoisted on board one night and in operation the next. The counter-shafting was done away with and the engine belt taken direct to the dynamo pulley, with 9 feet between centers, thus forming a fairly compact plant. Many other repairs and improvements have been made on board with the supplies forwarded. From the first the dynamo has worked smoothly and given great satisfaction. The arc lamp has been used for lighting up the ship when coaling at night, and for other purposes, and does not materially interfere with the steadiness of the incandescent lamps in circuit.

"The New Hampshire."—As stated in my report of last year, I have never inspected the plant of this ship, as it is maintained by the Bureau having cognizance of the training station. It has been learned from the quarterly reports made during the past year that there are installed a total of 354 lamps, viz: 337 of 16-candle power; 10 of 32-candle power, and 7 of 100-candle power. The insulation of the conductors of the ship, as set forth in the quarterly reports, was evidently so poor that there was imminent danger of fire. A report to this effect was forwarded to the Bureau of Equipment and Recruiting with the result, as appears by the quarterly reports, that new conductors were installed, though the latest appliances for this purpose, consisting of water-tight incombustible junction boxes, switches, etc., were not used.

"The Atlanta."—The plant of this ship continues to give satisfaction, although heavy and occupying great space. Frequently it is run a week continuously. Faults occasionally occur from bad insulation and defective fixtures. The lamps now number 292, and are all 16-candle power of the Weston type. They do not seem to be as long lived as some other types used in the naval service. The need of water-tight fixtures for use on the battery and upper decks is much felt.

"The Boston."—The plant of this ship as originally installed and described in my last report has not given satisfaction. The armature of the dynamo is of large diameter and has frequently chafed against the pole pieces, necessitating repairs, and even dressing down the pole pieces one-sixteenth of an inch. It has been found impossible to prevent considerable sparking at the commutator, and one set of brushes and commutator segments, used with the greatest care, will last only from six to eight weeks. The dynamo also heats too much to be fully efficient, when running with full load, and in this connection it may be remarked that the dynamo room is deficient in ventilation, the temperature in summer varying from 100° to 120° Fahrenheit. This high temperature has a very marked effect in decreasing the electro-motive force of the dynamo. The faults that occur in the installation generally arise from defective insulation of the conductors, from the want of efficient water-tight junction boxes and switches and water-tight fixtgres. The conductors used to instal this ship and the "Atlanta" are deficient in insulation and must be replaced in the near future. The engine, as stated in my last report, has not proved satisfactory, being entirely too heavy, frequently breaking down, and without satisfactory lubricating apparatus. It is much better calculated for land surface than marine work. There are now a total of 269 Swan lamps on board, 81 of 8-candle power and 188 of 16-candle power. This type of lamp gives great satisfaction both in length of life and illuminating properties.

Recently the Brush Company has removed the original plant of the "Boston" and substituted another of the following brief description: The dynamo is practically the same so far as its electrical dimensions are concerned, but it is hoped it will prove to be of better workmanship; instead of having a belt pulley on the end of the armature there is a compressed raw-hide pinion. The engine is of the Armington & Sims horizontal double-cylinder type, fitted with a cast-iron geared wheel, which engages the raw-hide pinion of the dynamo. The engine cylinders are 7 by 5 inches, and the gearing $2\frac{6}{10}$ to 1. The new engine and dynamo weigh about 2,500 pounds, and the old about 10,400 pounds. The deck space occupied by the new plant is 4 feet 3 inches by 6 feet 6 inches; that occupied by the old 4 feet 3 inches by 17 feet 5 inches. This plant has not been running long enough to decide upon its value, though at present it is very promising. The double cylinder Armington & Sims engine promises well for driving dynamos. It is very light and compact; it runs very smoothly and without noise, and its automatic governor is very efficient.

"The Chicago."—The installation of this ship has been compteted during the past year. It consists of two Edison compound wound dynamos of 105 volts and 160 amperes and two Armington & Sims horizontal single cylinder $12\frac{1}{2}$ by 10 inch engines. The dynamos are driven by short but very broad belts. The plant occupies a space of 20 by 6 feet and weighs 18,300 pounds. It was the most compact and the best adapted for marine work of any that could be obtained at the time the contract to install the "Chicago" was made. Though not yet tried by actual service, the ship not having been commissioned, it performed in a very satisfactory manner, each dynamo and its engine having made a continuous run of one week without accident or heating while being tested for acceptance. There are on board a total of 438 Edison lamps, made up of 121 of 10-candle power, 303 of 16-candle power, 8 of 32-candle power, and 6 of 50-candle power. With the exception of the fixtures, the fittings of this installation are very complete and of a superior character, and it is confidently expected that they will be very serviceable. The insulation resistance of the entire system is above 100,000 ohms.

"The Yorktown."—The contract of Messrs. William Cramp & Sons, Philadelphia, Pa., for building this ship requires that she shall be lighted by electricity. The specifications for the installation were prepared in this office, accepted by the builders, and a contract made by them with the Edison United Manufacturing Company, 65 Fifth avenue, New York, to perform all work connected therewith, and furnish all supplies except the fixtures. The latter are being made under my supervision by Messrs. Williams, Page & Co., 24 Beach street, Boston, Mass., in accordance with a contract made by that firm with the Messrs. Cramp & Sons. The work of installing the "Yorktown," now well advanced, is under the supervision of Lieut. T. E. DeWitt Veeder, U. S. Navy, as resident inspector. This ship will be supplied with two compound wound dynamos, each of 80 volts and 100 amperes, two Armington & Sims double cylinder and double acting horizontal engines, each directly connected to its dynamo by means of a flexible coupling. The engines will work at 60 pounds pressure and cut off at one-quarter stroke.

Ample precautions have been taken to insure efficiency, economy of space and weight, and noiselessness. The plant will be placed well below the water line, and the dynamo room will be well ventilated by means of a fan driven by an electric motor. The insulated wire being used in this ship is of excellent quality, and was manufactured by W. M. Habirshaw, 159 Front street, New York. Lengths 500 feet long, both with and without the lead covering, have been carefully tested in the laboratory at the Naval Academy and found, after having been immersed in sea water several days, to possess an insulation resistance of 2,000 megohms. All of the appurtenances of the installation are of the best quality, and much credit is due to Messrs. Cramp & Sons for obtaining the best supplies and material in the market. It is confidently expected that this installation when complete will be equal if not superior to any in the world.

"The Baltimore."—Detailed specifications for the lighting plant of this ship have been prepared in this office and accepted by Messrs. Cramp & Sons. They have, as in case of the "Yorktown," closed a contract with the Edison United Manufacturing Company to install the ship, but work on her has not yet been commenced, although the dynamos and engines and some of the other materials are now being manufactured. The plant will consist of two sets of dynamos and engines, each of the same voltage, but double the output of those for the "Yorktown," with the possible addition of a third set later. The engines will be the same size as those for the "Yorktown," but will work with a normal pressure of 80 pounds, cutting off at one-quarter stroke. The specifications for this ship are mainly like those of the "Yorktown," with a few improvements suggested by experience. This installation will also be under the supervision of Lieutenant Veeder, U. S. Navy, as resident inspector.

"The Charleston."—This ship is required to be lighted by electricity by her building contractors, the Union Iron Works, San Francisco, Cal., but the details of the work have not yet been agreed upon. Mr. Irving M. Scott, the general manager of the Union Iron Works, has informed this office that he proposes to use vertical engines of the Allen type, manufactured by the firm, and that he

has contracted with the Edison United Manufacturing Company for two dynamos similar to those designed for the "Baltimore."

"The Pensacola."—This ship is now being refitted as a flag ship and will probably be serviceable as a peace cruiser for several years, and after that has a prospective career as a receiving ship. For these reasons it was thought very desirable to install her with a single lighting plant of moderate cost. Accordingly detailed specifications were prepared in this office and bids in accordance therewith advertised for. The lowest bidder was the Edison United Manufacturing Company, 65 Fifth avenue, New York, with which a contract has been made to do all work and supply all materials. This ship will be installed with one 80-volt 200-ampere compound wound dynamo, making 400 revolutions per minute, driven by an Armington & Sims engine, directly connected with the usual flexible and insulating coupling. The engine will be of the same pattern and size as those for the "Yorktown," having cylinders 7 by 5 inches, and working with a normal steam pressure of 60 pounds, but cutting off at one-third stroke. There will be a total of about 268 lamps installed. The wire being used is of the "Yorktown" pattern, and all materials and appurtenances will be of the best quality and design. The installation is required to be completed and running in seventy days from signing the contract. Lieut. A. W. Grant, U. S. Navy, is the resident inspector in charge of the work.

Electric conductors in ships.—My recommendation of last year concerning the proper supervision of the installation of all electric conductors on ship-board, for whatever purpose, is renewed. In accordance with this recommendation this office was asked to suggest the electric signal apparatus for the "Yorktown," which was done, including therein a "slide steam whistle" for use as a signal for closing water-tight doors. The conductors for the electric signal apparatus of the "Yorktown" were selected by me, and are insulated with rubber of excellent quality. They are being inclosed in wooden molding where led about the ship, and therefore will be protected and accessible. The supervision of this work, as well as the selection of the signal apparatus, is performed by the resident electric light inspector, and the increased efficiency of the entire signal installation will be very great. It would be very advantageous for the ship if the search light, torpedo, and gun-firing wires were put up at the same time and under the supervision of the same officer, since he is not only an expert in the performance of this duty, but would keep all separate, a very important essential, and cause one to give way in space to another in accordance with the relative importance of each. The success of all electric apparatus very largely depends upon a careful attention to details, and the greatest difficulty by far that has ever been experienced with such apparatus on board ship is caused by faulty conductors badly installed.

Search-lights.—The Gramme search-light plants of the "Trenton," "Atlanta" and "Boston" are occasionally used for incandescent lamps at times when the incandescent plant is being overhauled. By coupling the two Gramme dynamos in series they will maintain from 40 to 50 16-candle power lamps continuously without overheating. By regulating the revolutions of the Brotherhood engine, the proper electro-motor force, as indicated by the volt meter placed in circuit, can readily be maintained. The "Chicago" has been installed by the Bureau of Ordnance with a search-light plant similar to those above mentioned. The 80-volt compound wound dynamo adopted by the Bureau of Navigation in May, 1887, and now being installed in the new cruisers, as already described, will, it is confidently expected, be very efficient for search-lights. Search-lights are at times very useful, but discretion must be exercised as to when and how to use them. During the recent English evolutionary squadron exercises, the search lights of the blockading squadron failed to detect the escaping ships of the enemy, which had, of course, all lights out and everything visible carefully colored a dead black. On the other hand, the enemy's ships which were not trying to escape used their search-lights to blind the eyes of the blockaders and interfere with the rays of their searchers. Recent experiments in Russia indicate that it is not an easy matter to disable a search-light with machine guns and shoulder rifles, on account of the light blinding the eyes and interfering with the aim. It is found in Germany, however, that if search lights are placed behind men with the beam of light on a target, very good practice can be made, so long as the men are in the beam, the sights of the guns then being illuminated; if, however, the men are out of the beam, and consequently invisible, the accuracy of the practice is much reduced. On the whole, search-lights promise to be a very useful adjunct on any sized vessel designed for warfare.

Electric lights at naval stations.—I desire to call attention to my recommendation of last year that the large and important navy yards be lighted by electricity. The advantages are many, and among them may be mentioned the facility furnished by the electric current for the transmission of power. But little demand would exist for electric lights in the day time, and therefore a large current would be available for other purposes. This can, by means of small and portable motors, be made extremely valuable for working drilling and other machines, requiring but little power, that are used in ship construction and for other purposes. As a matter of fact the need of small power-motors which are perfectly portable, for use where steam power is inaccessible, has long been felt. Arc lamps should be used for outside lighting and in large sheds and shops, while incandescent lamps should be used in offices, houses, and generally for inside work. I am prepared to recommend the best systems for this purpose. The scheme for the entire plant should be carefully and completely laid down before commencing, in order that the work of installation may be strictly progressive. The wires should be laid underground and have ample conducting area. Posts for arc lamps should be carefully placed and spaced and arranged so as not to cast shadows from their own lamps; they should also be so arranged as to render it impossible for any person to receive a shock from the high potential current used with arc lamps. There should be duplicate dynamos and engines in a plant of this kind for simplicity in working and on account of spare parts. Provision should also be made for spares and for portable cables and lamps to be taken wherever an emergency may call for night work. The specifications for a navy yard installation should be very carefully drawn in order to exclude the wretched and dangerous materials and workmanship so frequently found in electric light plants.

Receiving ships.—On account of the careful and strict police regulations required in these ships, where there are frequently large bodies of men and raw recruits, the latter often including men of vicious and dishonest character, the advantages and need of electric lights are great. These ships are generally supplied with boiler power, and therefore an electric lighting plant can be installed at moderate cost and economically maintained.

Demand for electricity on board ship.—The tendency now is to install all ships and even torpedo boats with electric lights, and to increase the power and number of search-lights. The use of incandescent lamps is found to very materially assist in rendering torpedo boats habitable. It is reported that in the English navy the dynamo rooms, located below the water line, are so warm and uncomfortable, in several instances, that dynamos for incandescent lighting are being placed on the upper decks for use when not in action. It is thought that this difficulty can be overcome in our ships by the use of fans driven by electric motors. It is not improbable that small electric motors for some other purposes may be required, but it is not likely that they will be used to any great extent on account of a want of economy, and because their use would require very large electric plants without in any way reducing the boiler capacity or other machinery of the ship. The peculiar function of electric motors is for places where the power is so small that the slight loss in economy is more than overcome by the facility afforded for transmission, where the transmission is for a long distance, and where other motors are inaccessible or not portable.

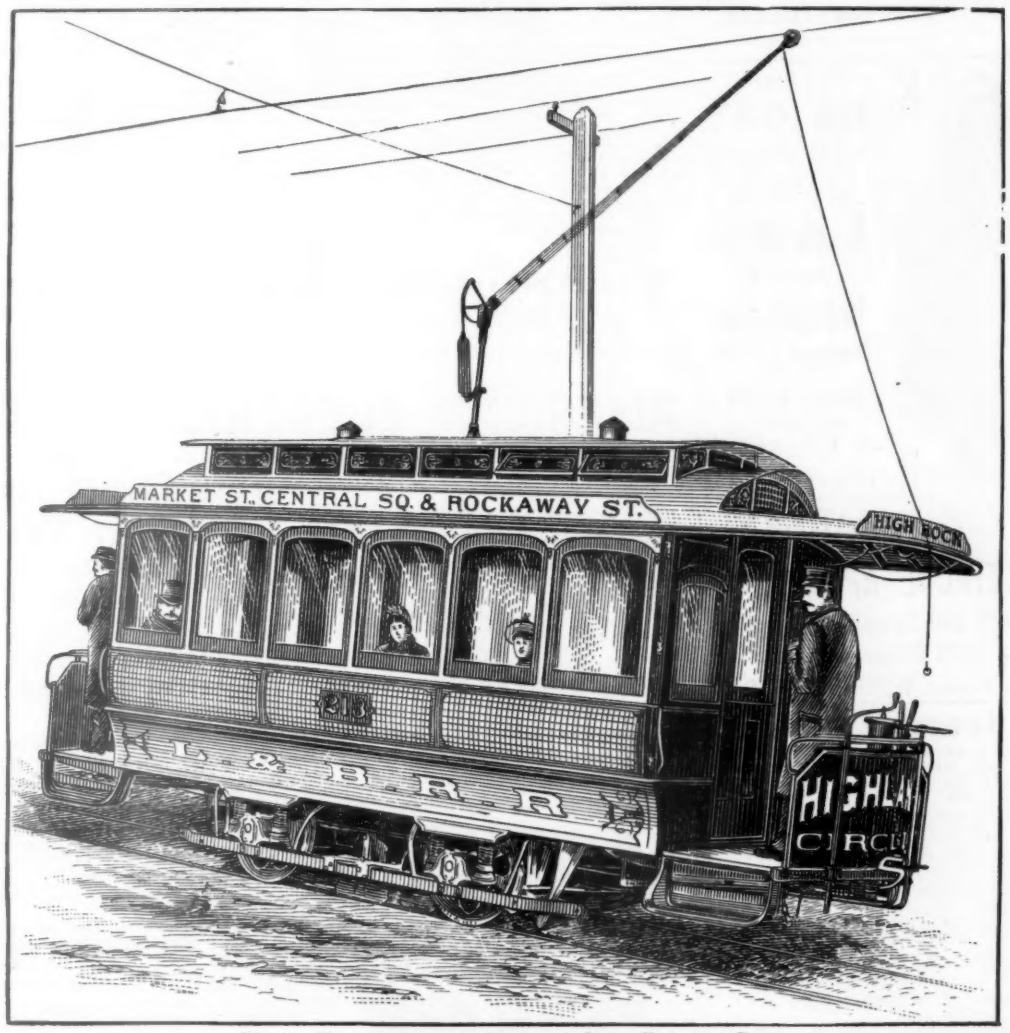

FIG. 2.—VIEW OF CAR ON GRADE AT LYNN ELECTRIC ROAD.

ELECTRIC LIGHT NEWS

—— An electric light plant will soon be put in operation in Cleveland, Tenn., and also one in Dayton, Tenn.

—— There is talk of an electric light plant for Rock Hill, S. C. Major John London has the matter in charge.

—— The City Council of Baton Rouge, La., are negotiating to establish an electric light for the public streets of the town.

—— Permission has been given by the Council of Rutland, Vt., to the Marble City Electric Light Company to operate a plant in the town.

—— R. M. Jones, of the Edison Electric Light Company, of Salt Lake City, has gone to Park City to put in a plant there, to be run by water power.

—— The Thomson-Houston Company, of Philadelphia, has closed a contract for 1,500 incandescent lights with the Camden, N. J., Electric Light Company.

—— The Tiffin, O., gas works, owned by Congressman Seney, were destroyed by fire Nov. 27th. The loss will reach $5,000. As a result the city will be in darkness for a week or more.

—— M. R. Muckle, Jr. & Co., of Philadelphia, have arranged with the electric lighting interests of Bristol, Penna., to install an alternating current plant of the Westinghouse system.

—— C. A. Bragg, of the United States Electric Lighting Company, has recently sold a 600 light incandescent plant to be installed in the large morocco manufactory of McNeely & Co., in Philadelphia.

—— George W. Silsby, of the Edison United Manufacturing Company, of New York, has closed contracts with James E. Taylor, of Cape May, for the construction work of the two Edison plants, at Burlington and Mt. Holly, N. J.

—— Salem, N. J., after dallying with the electric light question for the past three years, has finally closed a contract for a Westinghouse plant with parties from New York, and active preparations for its installation are now in progress.

—— Lynn, Mass., is becoming a thoroughgoing center of electrical interest. Besides the factories owned and occupied by the Thomson-Houston Electric Company and the Thomson Electric Welding Company, an electric street railway has been constructed and is now in daily operation there.

—— The board of gas commissioners, of Boston, Friday granted the permission desired by the Newton & Watertown Gas Light Company to engage in the business of electric lighting, prescribing as a minimum plant one with a capacity of 90 arc lights of 1,200 candle power, and 1,500 incandescent lights of 16 candle power each.

—— At a meeting of the stockholders of the new Jenkintown, Pa., Water and Light Company on Monday the following officers were elected: M. L. Kohler, president; Charles Wilson, treasurer; Joseph Hunter, secretary; directors, Charles Hewitt, Beauveau Borie, Edwin Satterthwait, Charles F. Wilson, M. L. Kohler, J. W. Pullman and Joseph W. Hunter. The amount subscribed was $41,500.

—— The Webster Electric Company, of Webster, Mass., has bought the Webster gas light plant, and the two plants will be run under the same management, the Webster Electric Light Company. The company will purchase a new engine and boiler, and with the present power will have a capacity of 500 incandescent and 80 arc lights. The system is the Thomson-Houston; the stock raised to $45,000; the work of putting in a street circuit will be begun at once, and if good weather holds, Webster will be lighted with 37 arc lights. The directors are full of push and no delay in the work will be allowed.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING NOVEMBER 27, 1888.

393,348 Apparatus for removing metallic particles from paper pulp; Charles H. Atkins, Boston, Mass.

393,353 Porous cup for galvanic batteries; Horatio J. Brewer, New York, N. Y.

393,365 Switch or circuit changer; William W. Griscom, Haverford College, Pa.

393,373 Electric motor; Fred. J. Keller and James W. Carnes, Massillon, Ohio.

393,389 Controller for electric circuits; Walter J. Paine, Boston, Mass.

393,391 Filament for incandescent lamps; Gilbert S. Ram, Montclair, N. J., assignor to Theodore Mace, same place.

393,395 Galvanic battery; Hilborne L. Roosevelt, New York, N. Y.; Alfred Roosevelt, executor of said Hilborne L. Roosevelt, deceased.

393,396 Natural gas protective extinguisher; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

393,402 Device for exhibing magnetic and non-magnetic watch movements; Alfred C. Smith, New York, N. Y.

393,405 Arc light; Donlee B. Turner, Chicago, Ill.

393,422 Oiler for commutator; Thomas E. Craig, Akron, Ohio.

393,431 Train signal; Albert C. Griggs, Wilmington, Del.

393,447 Electric arc lamp; Gustav Pfannkuche, Exeter, N. H.

393,448 Regulation of alternate current generators; Gustav Pfannkuche, Cleveland, Ohio, assignor to the Brush Electric Company, same place.

393,469 Dynamo electric machine; William W. Griscom, Haverford College, Pa., assignor to the Electro Dynamic Company of Philadelphia.

393,470 Distribution of electricity by secondary batteries; William W. Griscom, Haverford College, Pa.

393,473 Incandescent electric lamp; Edward H. Jonson, New York, N. Y., assignor to the Edison Electric Light Company, same place.

393,477 Art of laying underground conduits; Wilmot Lake, Washington, D. C.

393,508 393,509 Multiple switchboards; Milo G. Kellogg, Hyde Park, Ill.

393,525 Automatic gas lighting and extinguishing apparatus; Nathaniel H. Shaw, Somerville, Mass., assignor to the American Automatic Gas Lighting Company, Portland, Me.

393,526 Electric depositing cell; Edward L. Smith, Ansonia, Conn., administrator to Luther L. Smith, deceased.

393,529 Telephone exchange; William B. Vansize, Plainfield, N. J.

393,558 Electric Letter box; Charles F. Harms, Hoboken, N. J.

393,572 Apparatus for propelling cars. 393,573 393,575 393,576 393,577 Secondary battery. 393,574 Electric light regulator. 393,578 Production of zinc chloride, etc.; Leonard Paget, New York, N. Y., assignor to the Macracon Storage Battery Company, same place.

393,590 Regulator or cut off for generators; Daniel W. Smith, St. Louis, Mo., assignor of one-half to Joseph C. Addington, same place.

393,596 Electric fluid pressure engine; George Westinghouse, Jr., Pittsburgh, Pa.

393,622 Conduit for electric railways; Madison Dallas, New Orleans, La.

393,624 393,625 Coin operated induction coil; Charles Durieux, New Orleans, La., assignor to the Southern Automatic Electric Shock Machine Company, same place.

393,636 Dynamo electric machine and electric motor; Warren P. Freeman, New York, N. Y.

393,637 Electric striking attachment for clocks; James H. Gerry, Brooklyn, N. Y., assignor to the Self Winding Clock Company, same place.

393,639 Galvanic battery; James L. Gethins, Boston, Mass.

393,644 Non-conducting composition; Salomon Heimann, New York, N. Y., assignor of eleven-twentieths to Irving H. Brown, Plainfield, N. J.

393,657 Electric light burglar alarm indicator; Richard and Isaac E. Cochran, Jr., Chester, Pa.

393,704 Globe for electric lamps; Salomon Heimann, New York, N. Y.

393,710 Electric belt. 393,711 Electric door opener; Adam Lungen, New York, N. Y.

393,733 Incandescent electric lamp socket; William F. Wollin, Lancaster, and Elmer H. Werline, Williamsport, assignors of one-third to Harry B. Cochran, Lancaster, Pa.

CONTRACT TO LET.

The City of Sedalia will receive bids for lighting the streets and public places of said city by electricity, in part, or in whole, estimated population 20,000. For particulars address.

JOHN CASHMAN,
Chairman Com. on Lighting
SEDALIA, MO.

Approved Nov, 26th, 1888.
JOHN D. CRAWFORD, Mayor.

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2 8-Light Richter Arc Dynamos, with 16 single lamps.
1 15-Light Brush Dynamo, with 15 single lamps.
1 300-Light Brush Swan Incandescent Dynamo with lamps and sockets.

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THE VIRGINIA ELECTRIC LIGHT & POWER COMPANY, OF RICHMOND, VA.
NEW YORK OFFICE, 63 WALL STREET.
New York, August 21st, 1888.

A. F. MASON, Esq.,
SIMPLEX ELECTRICAL CO.,
Boston, Mass.

Dear Sir:
I have been using the Simplex Wire on a large portion of our lines in Richmond, Va., for the past five months. I have taken daily tests of the insulation during that time. The longest single circuit I have is about five miles, and at no time has the insulation test ever been less than one megohm. I cannot speak too highly of the wire or its insulation. A large portion of it has been run through foliage and trees in the streets, and upon examination a few days ago I failed to find any place where the wire has been abraded by coming into contract with the branches of trees. My instrument does not measure over one meghom, and I cannot tell how much higher the insulation may have measured. One megohm on wires in circuit is euough for me.

Yours very truly,
W. H. COLE, *Superintendent.*

THOMSON-HOUSTON ELECTRIC CO.,
AUGUSTA, GA.
August 12th, 1888.

Dr. A. F. MASON,
SIMPLEX ELECTRICAL COMPANY,
328 Washington St., Boston, Mass.

Dear Sir:
We are using in our arc-lighting circuits about twenty (20) miles of your Simplex T. Z. R. wire.
We have feund the insulation a most perfect protection against moisture and the abrasion of small tree limbs.
Have used your wire in our station, for running through trees, on buildings and porches, under mouldings, etc., and through cellars, and we have never been able to discover a "ground" upon any circuit since our plant was put into operation.

Very truly yours,
JOHN H. WATERMAN.

ADDRESS,
The Simplex Electrical Co.,
328 WASHINGTON STREET, BOSTON, MASS.

EUGENE F. PHILLIPS, President. W. H. SAWYER, Secretary and Electrician.
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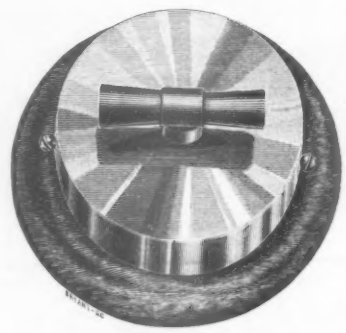

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